FINAL PROGRAM

# AEROMAT/ITSC/IMS CO-LOCATED FOR THE FIRST TIME

### MAY 11-14, 2015 LONG BEACH CONVENTION CENTER LONG BEACH, CALIFORNIA, USA







# **TOGETHER, WE CAN TAKE WING.**

The pioneers of aviation taught us that whatever the endeavor, passion and vision are the true drivers of innovation and success. Boeing is proud to salute those with the passion and vision to turn dreams into reality.



# REGISTRATION

#### **Conference Registration Hours:**

Sunday, May 10	4:00 p.m8:00 p.m.
Monday, May 11	7:00 a.m.–7:00 p.m.
Tuesday, May 12	7:00 a.m.–5:00 p.m.
Wednesday, May 13	7:30 a.m.–5:00 p.m.
Thursday, May 14	7:30 a.m.–12:00 p.m.

# **CO-LOCATION BENEFITS**

As an added benefit of registering as an AeroMat 2015 or ITSC 2015 attendee, you receive access to all three co-located events (Aeromat 2015, ITSC 2015 and Microstructural Characterization of Aerospace Materials and Coatings (IMS) technical programs) at no additional charge. Additionally, AeroMat 2015 and ITSC 2015 conference attendees receive access the Extended Abstracts for AeroMat, Proceedings for ITSC and Extended Abstracts for IMS online. See page 3 for download instructions.

# **SESSION CHAIRS**

Session Chair Packets will be available daily starting at 7:15 a.m. each morning of the conference (ITSC Session Chairs pick up packet in Room 103A and AeroMat Session Chairs pick up packets in Room 203B). Session Chairs are to pick up their session packet, which includes the session details, author biographies and pertinent session details and meet your presenting authors in the session room thirty minutes prior to the start of the session to upload presentations.

# **SPEAKERS**

All speakers should plan to meet in the meeting room of their presentation thirty minutes prior to the start of the session. This will allow all speakers the opportunity to meet their session chair, upload their presentation and go over any final conference details and audio visual concerns.

# **EXPOSITION**

The Show Directory can be found on pages 95 Exposition Hours • Long Beach Convention and Entertainment Center • Exhibit Halls A&B

#### Monday, May 11

12:00 p.m7:00 p.m.	
Lunch	. 12:00 p.m.–1:15 p.m.
Opening Plenary Session on the Exhibit Floor	1:30 p.m3:00 p.m.
Refreshment Break	. 3:00 p.m.–3:30 p.m.
Expo Welcome Reception	5:30 p.m7:00 p.m.

#### Tuesday, May 12

9:00 a.m.–4:00 p.m.	
Refreshment Break	10:00 a.m.–10:30 a.m.
Lunch	12:00 p.m1:00 p.m.
Combined Plenary Session on the Exhibit Floor	. 1:00 p.m.–3:30 p.m.
Refreshment Break	3:30 p.m.–4:00 p.m.

#### Wednesday, May 13

9:00 a.m.–4:00 p.m.	
Refreshment Break	10:00 a.m10:30 a.m.
Refreshment Break	3:00 p.m3:30 p.m.

# **REFRESHMENT BREAKS AND LUNCHES**

Morning and afternoon refreshment breaks will be provided. Lunch is included with full conference registrations and will be in Exhibit Halls A&B on Monday and Tuesday. Attendees are on their own for lunch Wednesday, May 13<sup>th</sup>—there will be concessions available throughout the hall as well as restaurants within walking distance.

# **MOBILE APP**

This year's conference mobile app (MegaShow 2015) will provide key information regarding the AeroMat, ITSC and IMS technical programs, exposition and social events. Available for Apple and Android devices. Please see page 5 or visit the Registration Desk to learn more about the app.

# PROCEEDINGS

Each full conference registrant will receive online access to the AeroMat Abstracts, the ITSC Proceedings and IMS Extended Abstracts. Please see page 3 for specific instructions on how to download this content.

# **CAREER/RESUME BOARD**

Post your resume or company's current job openings on the Career/Resume Board near Registration.

# **AMERICANS WITH DISABILITIES**

In accordance with the Americans with Disabilities Act (ADA) of 1990, ASM International is striving to accommodate all of our guests with special needs. If a disability requires that you have access to modified housing, transportation or other assistance, please inform conference staff.

# POLICY ON AUDIO AND VIDEO RECORDING OF TECHNICAL PAPER PRESENTATIONS/SESSIONS

ASM International<sup>®</sup> reserves the right to any audio and video reproduction of presentations at every technical session. Recording of sessions (audio, video, still photography, etc.) intended for personal use, distribution, publication or copyright without the express written consent of ASM and the individual is strictly prohibited.

# POLICY ON CELLULAR PHONE USAGE

In consideration of fellow event attendees and presenters, show management kindly requests your cooperation in minimizing disturbances which may occur during technical sessions. We ask that cellular phones or other electronic devices be placed in "silent mode" while you are in the meeting rooms. Please step outside the meeting room if you need to have a conversation.

# **CONFERENCE PROCEEDINGS**

Conference Proceedings are available to all registered attendees. To access and download the proceedings, log into ASM International's website and look up AeroMat 2015, ITSC 2015, or IMS 2015 within the Conference Proceedings webpage.

#### Download Instructions: Conference Proceedings or Extended Abstracts

We are honored to offer the extended abstracts to all attendees who receive the proceedings with their conference registration. The conference proceeding is made possible through the diligent work of all the individuals who created the extended abstracts, the technical chairs, and the proceeding editor. Below are the step-by-step instructions on how to access the proceedings for AeroMat 2015, ITSC 2015, or IMS 2015.

1. Go to **www.asminternational.org** AND log-in the site using your ASM ID and Password. You will receive this information through email. See registration if you need your ASM ID to login. Please note if you register within two weeks of the conference or on-site, access to the proceedings will be available 24–48 hours after the start of the conference.

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4. Enter AeroMat 2015, ITSC 2015, or IMS 2015 in CONFERENCE PROCEEDINGS SEARCH field and click on SEARCH .

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5. Click on the search results to access the complete proceedings or extended abstracts.

All Proceedings files are in Adobe PDF format. To view/print these files you will need to have a PDF reader installed, which comes standard with most personal computers. If you need to obtain a PDF reader, see the Adobe website at http://get.adobe.com/reader/, for information about downloading a free PDF reader.

# **ATTENDEE LUNCHEONS**

Monday, May 11 from 12:00 p.m.–1:15 p.m. and Tuesday, May 12 from 12:00 p.m.–1:00 p.m., Inside Exhibit Halls A&B

Join us for lunch on the Exhibit Floor Monday and Tuesday. One ticket for each lunch is provided with full conference registration. Additional tickets are available for purchase on-site.

Monday Lunch—Enjoy a tasting of International cuisine Tuesday Lunch—A Taste of California Concessions also available for purchase

#### **Refreshment Breaks**

Morning and afternoon refreshment breaks are offered throughout the conference.

Monday, May 11:	Morning Refreshment Break—Meeting Space Foyer
	Afternoon Refreshment Break—Exhibit Halls A&B
Tuesday, May 12:	Morning and Afternoon Refreshment Break—Exhibit Halls A&B
Wednesday, May 13:	Morning Refreshment Break—Exhibit Halls A&B
	Afternoon Refreshment Break—Exhibit Halls A&B
Thursday, May 14:	Morning Refreshment Break—Meeting Space Foyer

#### Expo Welcome Reception

Monday, May 11, 2015 from 5:30 p.m.–7:00 p.m.–Inside Exhibit Halls A&B All are welcome! Connect with exhibitors in a relaxed environment as we celebrate the opening of our co-located events! *Attending the Welcome Reception is included in registration fee.* Wine and beer tastings from 5:30 p.m.–6:30 p.m. See page 99 for more information!

PLEASE NOTE, during the expo welcome reception a Remote Pilot Vehicle will be on the tradeshow floor taking aerial shots of the event.

# **CONFERENCE SOCIAL EVENT**

#### Tuesday, May 12 at the Queen Mary • 7:00 p.m.-10:00 p.m.

Enjoy an evening with friends and colleagues during this year's exciting social event aboard the Queen Mary! Join us for a reception style dinner with live entertainment, two drink tickets and a cigar bar. Don't miss out on this one-of-a-kind social event that won't disappoint! All Aboard! Cocktail attire optional. Transportation included.

\*Ticket required and sold separately—tickets available for sale at Registration through Monday at 12:00 p.m.

# **TRANSPORTATION SCHEDULE**

**Transportation to the Queen Mary from the Hyatt Regency Long Beach** will run on a flow with the first bus departing at 6:45 p.m.

**Transportation to the Queen Mary from the Hyatt the Pike Long Beach** departing at 6:45 p.m. and 7:30 p.m. After 7:30 p.m., buses will depart from the Hyatt Regency Long Beach.

**Transportation leaving the Queen Mary** will be available until 10:15 p.m. and will drop off at the Hyatt Regency Long Beach and Hyatt the Pike Long Beach

# **STAY CONNECTED AT THE SHOW IN THREE DIFFERENT WAYS!**

1 Follow show news on Twitter or share your photos and videos by using hashtag **#2015MegaShow** 

2 Like the ASM International Facebook page

**3** Download the official AeroMat, ITSC and IMS Event App (for Apple and Android devices)

The app provides instant access to show information you need to know!

- Complete technical program including abstracts
- Exhibitors information booth locations
- Surveys
- Contact fellow attendees
- Announcements and maps for quick navigation

#### App Name: MegaShow 2015

See Registration for mobile app technical support

# **5K FUN RUN MAP**

**TUESDAY, MAY 12, 2015** 



Downtown Long Beach Map

5k Fun Run Map

Meet poolside at the Hyatt Regency Long Beach (headquarter hotel) at 5:45 a.m. for registration. Fun Run/Walk starts at 6:00 a.m. with energizing refreshments poolside upon competition of 5k route

This 5k route offers some of the best waterfront views in Downtown Long Beach













Pre-registration is required

twitter.com/visitlongbeach

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# **CONFERENCE FLOOR PLAN**



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# **PLENARY SPOTLIGHTS**

# **MONDAY, MAY 11**

1:30 p.m.-3:00 p.m.

#### **Dr. John Grotzinger** Chief Scientist and Head of Strategic Planning for Mars Rover Mission

Dr. John Grotzinger is the chief scientist and head of strategic science planning for NASA's \$2.5 billon Curiosity rover mission to



Mars, which riveted the country with its dare-devil landing. A veteran geologist of more than 30 years of exploration of Earth and Mars, Grotzinger has led expeditions to the far corners of the globe. He now heads the most visible mission in the history of robotic space exploration in its search for evidence of past life. He received NASA's prestigious Outstanding Public Leadership Medal for the unprecedented success of the mission, and Popular Mechanics named him No. 2 on its list of "10 Innovators who Changed the World." Discover magazine also listed the Mars Curiosity rover giving researchers unprecedented access to the Red Planet as No. 1 in its list of the "Top 100 Science Stories of 2013." Exclusively represented by Leading Authorities speakers bureau, Grotzinger discusses strategic planning, motivating and leading teams working under intense pressure, and the need to take on a "grand challenge" while sharing awe-inspiring and cutting-edge stories, video, and photos about space and unexplored territories of Mars. Grotzinger combines tales of adventure and discovery with lessons in leadership, consensus building, and novel applications of technology that is literally out of this world.

Mars Exploration. Leading a team of more than 450 scientists, Grotzinger is responsible for future planning, parallel operations, determining Curiosity's exploratory sites, and ensuring smooth and productive collaboration between several independent engineering teams—a key element of mission success. The rover's objectives include characterization of the Martian landscape, measuring radiation levels to enable future human exploration, and analyzing soil and rock samples in an effort to find environments that could have once supported life. Since 2003, Grotzinger also has worked on the Spirit and Opportunity rovers. In 2004, he and Opportunity rover team made the discovery of evidence for liquid water on ancient Mars based on image, mineralogical, and chemical data. In 2007, he became a member of the HiRISE camera imaging team on Mars Reconnaissance Orbiter.

Geological Roots. Grotzinger is interested in the evolution of surficial environments of Earth and Mars. Because the planets are thought to have had similar early climates and geologic conditions, his work on early Earth helps guide Curiosity's exploration of early environments on Mars. He has led field missions to arctic Canada, Siberia, Africa, and Oman and has worked closely with the oil and gas industry, serving as a consultant for frontier exploration in the Middle East. For his great contributions to understanding the co-evolution of life and environment on early Earth, Grotzinger received the Charles Doolittle Walcott Medal from the National Academy of Sciences—awarded once every five years. For his work in the geology and geochemistry of hydrocarbon exploration, he was honored with the 2012 Halbouty Award of the American Association of Petroleum Geologists.

Education and Professorships. Grotzinger was the Robert Shrock professor of geology at MIT, were he worked from 1988–2005. There, he was also named the Waldemar Lindgren distinguished scholar. He moved to the California Institute of Technology (Caltech), where he was the Moore distinguished scholar in 2004 and the Fletcher Jones professor of geology starting in 2005. He was also a distinguished visiting scientist at NASA's Jet Propulsion Laboratory from 2004–2006.

# TUESDAY, MAY 12

1:00 p.m.-3:30 p.m.

1:00–1:45 p.m. – Mr. Humberto Luiz de Rodrigues Pereira 1:45–2:00 p.m. – ITSC/TSS Award Presentations

- 2:00–2:45 p.m. Dr. Robert Vaßen
- 2:45-3:30 p.m. Dr. Frank Mücklich



Mr. Humberto Luiz de Rodrigues Pereira, VP Engineering and Technology with Embraer Presenting: 'A Vision on how advanced Materials may address the challenges of future aircraft'

**Abstract:** The aeronautical sector is characterized by low production rates, high competition which demands better product performance, lower costs, frequent product evolution and flexible manufacturing systems.

# **MEGASHOW 201**

# **PLENARY SPOTLIGHTS**

In addition, environmental aspects such as emissions, noise and new cabin comfort standards will continue to be important drivers for new technologies.

This presentation intends to bring a vision on how advanced materials and future manufacturing processes may address these challenges.

**Biography:** Humberto Luiz de Rodrigues Pereira, Vice-President, Engineering—Executive Jets, is responsible for the development, certification and support the operation to all executive aviation products.

Humberto has been working for Embraer for 25 years. He started his carrier as a stress engineer, working in the development of several products such as EMB-120—Brasilia and EMB-312—Tucano. He led the ERJ-145 Structural Engineering Team being responsible for the design of the entire primary structure of this airplane.

In 1998, he was assigned Manager of Structural Engineering responsible for all Embraer airplanes, including EMBRAER 170 and EMBRAER190. In 2001, he became a member of the Aviation Rulemaking Advisory Committee.

He was assigned Product Support Engineering Director in 2005, involved in all engineering aspects related to Embraer airplanes in operation. In 2007 he took over as Director of Development Engineering dedicated to all Embraer development products.

Since 2009, he has taken over the position of Director of Engineering for Executive Aviation Market, responsible for all products, including aircrafts in development phase and those which are in operation. Among these aircrafts, there are in operation: Phenom 100, Phenom 300, Lineage 1000, Legacy 600 and Legacy 650 and, finally, at full development is the Legacy 500

He was graduated from Federal University of Minas Gerais (Universidade Federal de Minas Gerais – UFMG) in Mechanical Aeronautical Engineering and specialized in Aeronautical Structures at Aeronautics Technological Institute (Instituto Tecnológico de Aeronáutica – ITA).



Prof. Dr. Robert Vaßen, Professor of Mechanical Engineering, Ruhr-University Bochum Presenting: Recent Advances in Thermally Sprayed Thermal Barrier Coatings

Abstract: Thermal barrier coatings are widely used in both stationary and aero gas turbines to improve their efficiency by allowing an increase of the turbine inlet temperature. Standard manufacturing processes are atmospheric plasma spraying (APS) and electron beam – physical vapor deposition (EB-PVD). While the more expensive EB-PVD process is mainly used for the coating of highly loaded blades in aero engines due to its columnar, highly strain-tolerant microstructure, APS is the deposition method applied for most of the other applications. This deposition process gives as an excellent thermal cyclic performance due to its micro-cracked, porous microstructure. In the last decades in addition to APS advanced thermal spray methods have attracted much attention. One is suspension or solution plasma spraying which allows the deposition of fine species in the sub-micrometer range and by that the manufacture of new microstructures as highly segmented and columnar ones. Another advanced process is plasma spray-physical vapor deposition (PS-PVD) in which powderous feedstocks are evaporated and extremely strain-tolerant microstructures can be established. Besides new processes also advanced materials beyond the standard yttria stabilized zirconia (YSZ) are studied intensively. One favorite material is gadolinium zirconate which is typically applied in a so-called double layer system with YSZ underneath. This material also shows an improved resistance against Calcium Magnesium Aluminum Silicate (CMAS) attack which is also an important research topic. Further recent activities described in the talk are related to advanced bond coats, to embedded additional functionalities in the coatings and to diagnostic concepts in the thermal spray process.

**Biography:** Dr. Vaßen is Professor of Mechanical Engineering at the Ruhr-University Bochum in Germany and employed at Forschungszentrum Jülich GmbH, where he researches energy systems.

# **PLENARY SPOTLIGHTS**

He is also a guest professor at University West, Trollhattan, Sweden.

Professor Vaßen's research fields include thermal spray technology, protective high-temperature coatings (thermal and environmental barrier coatings), powder technology, ceramics processing, lifetime modelling, and solid oxide fuel cells and membranes.

His projects include several European projects on TBCs (SAMBA) and membranes (DEMOYS), DFG-projects on Bondcoats, TBCs and stresses in thermal spray coatings, federal government funded project on new TBCs, abradables and repair, and industrial projects on coating development and testing.

He obtained his doctoral degree in physics in 1990 at the Rheinisch-Westfälische Technische Hochschule Aachen. Robert Vaßen is author and co-author of more than 160 papers and holds more than 10 patents. He is active in different committees of the German and American ceramic society and worked as organizer and session chair in different materials conferences and workshops.



**Dr. Frank Muecklich,** Saarland University, Chair Functional Materials and Materials Engineering Center Saarland, Campus D3 3, 66123 Saarbrücken, Germany **Presenting:** Understanding microstructure formation by 3D analysis in the micro, nano and atomic scale

**Abstract:** 3D microstructure characterization plays a key role for the quantitative understanding of the relationship between processing, microstructure and properties of high performing materials. However, it could not be fully exploited so far due to the lack of adequate 3D characterization techniques in some of the relevant scales. Recent progress in tomographic techniques has led to quantitative insights into the evolution of materials microstructures with gradual field of view sizes. We present hierarchical investigations for complex microstructure morphologies e.g. of an important lightweight material for automobiles – the Al-Si alloys. The interdendritic Al-Si eutectic network with its 3D shape and arrangement plays an essential role for stiffness, toughness and strain at fracture. The eutectic seeding on the atomic scale [1], the microstructural growth mechanisms on the nano scale [2] as well as their stochastic effect in the micro scale on the macroscopic properties are still under discussion and the materials are potentially far away from being optimal.

 J. Barrirero, M. Engstler and F. Muecklich, Light Met. 2013
 (John Wiley & Sons, Inc., 2013). doi:10.1002/9781118663189
 F. Lasagni, A. Lasagni, M. Engstler, H.P. Degischer and F. Muecklich, Nano-characterization of Cast Structures by FIB-Tomography., Adv. Eng. Mater. 10, 62–66 (2008).

**Biography:** Frank Muecklich (Prof.Dr.-Ing.) studied Materials Science and Engineering and obtained his PhD (Dr.-Ing.) at the Freiberg University of Mining and Technology (1988). After having a leading position at the Max-Planck-Institute for Metals Research in Stuttgart he was appointed as professor and head of the Chair for Functional Materials at Saarland University (1995). Since 2008 he has also been Chairman of the European School of Materials (EUSMAT) at Saarland University. In addition to this, he has been the scientific director and CEO of the Materials Engineering Center Saarland (MECS) since 2009.

Frank Muecklich published more than 300 scientific papers, holds 12 patents and is co-author of the textbook "Statistical Analysis of Microstructures in Materials Science" (Wiley). Since 2014 he has been the Editor of "Practical Metallography", the international journal for preparation, imaging and quantitative analysis of materials microstructures (Hanser). In 2013 he was appointed as the Scientific Chairman of Europe's largest scientific conference in Materials Science and Engineering, the EUROMAT2013 in Seville (Spain).

His main fields of scientific interest are:

- 3D analysis of materials microstructures in the micro, nano and atomic scale
- High performing surfaces by 2D+ microstructure design and surface functionalization
- Advanced functional materials with tailored microstructures for electrical application

For his scientific work Frank Muecklich received various national and international awards such as Georg Masing Memorial Prize, Werner Koester Prize, Roland Mitsche Prize, Alfried Krupp Prize. In 2009 he was appointed as the Morton Antler Memorial Lecturer of IEEE in Vancouver. In 2012 he was awarded the Loehn Prize of the Steinbeis foundation for the most successful transfer of science into business. In 2013 he received the Copper Prize of the German Copper Institute.

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# **ITSC 2015** 43

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# SHOW DIRECTORY 95

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Understanding How Components Fail, 3rd Edition



### WELCOME



characterization.

n behalf of the Organizing Committee I am honored to welcome you to AeroMat 2015 in sunny Long Beach, California. This year the event was organized jointly with the International Thermal Spray Conference (ITSC 2015) and Microstructural Characterization Aerospace Materials and Coatings (IMS 2015). This provides unique opportunity to become acquainted with not only the latest breakthroughs in aerospace materials/manufacturing processes but also a variety of surface enhancement treatments and latest developments in microstructural

For the past twenty-six years, AeroMat has maintained a status of being the preeminent annual forum that facilitates the interchange of pertinent technical

information on aerospace industry materials and processes. We continue with the theme "The Latest Word in Aerospace Materials." To support this ambitious theme, this year's venue will include over 160 technical presentations, plenary speakers featuring the aerospace industry's most preeminent leaders in aerospace materials and a diverse exposition. You can expect high-quality papers covering topics in aluminum, magnesium, titanium, thermomechanical processing, high-strength steels, high-temperature alloys, welding and joining, coatings and surface treatments, and materials and processes for space applications; plus, a very large session on additive manufacturing. Our plenary speakers representing NASA and aircraft builders will cover topics ranging from Curiosity Mars Rover robotic space exploration in its search for evidence of past life to an overview of the development, certification and support for the operation of all executive aviation products. The exposition has been expanded to a record 80 companies and organizations showcasing state-of-the-art products/services.

As chairman of the organizing committee, I was privileged and honored to work with an extremely dedicated team of aerospace and material science professionals. At the same time, we are indebted to the ASM team who provided tremendous support and guidance during the past eleven months. We are hopeful that you will have an opportunity to network, establish new technical/business contacts, become familiar with/introduce new technologies or enjoy the exhibits. With that, the entire team welcomes you to Long Beach and AeroMat 2015 and wishes for a productive experience.

#### **Michael Niedzinski** Chairman Aeromat 2015

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# **2015 AEROMAT ORGANIZING COMMITTEE**

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> Mr. Hank Phelps Lockheed Martin

Dr. Daniel G. Sanders, Ph.D, FASM Boeing

**Dr. Jeffrey Waldman, FASM** Navmar Applied Sciences Corporation

Dr. Kuang-o Yu, Ph.D, FASM RTI INTERNATIONAL METALS, INC

# **SESSION DESCRIPTIONS**

# **ADDITIVE MANUFACTURING**

The Additive Manufacturing (AM) sessions will include presentations on recent advances in metallic AM processes and technologies in the aerospace, medical and transportation industries. Presentations will cover AM methods, applications, materials & processes, mechanical properties as well as design practices. Presentations on AM methods will cover the various deposition processes used to produce metallic components. Applications will include both prototype and production implementation and examples of associated lessons learned. Secondary processing required, including heat treatment, surface finishing, repair & non-destructive inspection (NDI) will be covered in the Materials & Processes session. AM design practice topics will include design criteria, modeling & simulation techniques, analysis methods, certification requirements and the use of reverse engineering.

# ADVANCED ALUMINUM ALLOYS-LIGHT HIGH PERFORMANCE ALLOYS AND STRUCTURES

The "Advanced Aluminum Alloys—Light High Performance Alloys and Structures" sessions cover research, development and applications of Aluminum alloys and Aluminum alloy-based hybrid materials (e.g., FML, MMC). The technical presentations cover subjects ranging from alloy development, processes involved in the manufacture of aluminum products and structures, and evaluations of the performance of structural subcomponents and components. Focus areas include the development, processing, manufacture and application of recently commercialized aluminum alloys including Al-Li alloys; the corrosion and durability properties of new aluminum alloys; and new design and manufacturing technologies aimed at reducing cost of aluminum and hybrid structures.

# COMPOSITE MATERIALS, PROCESSES AND STRUCTURES

Research and development of composite materials, processes and structures have continued their high rate of growth and application for advanced aircraft designs. While the vast majority of composite materials systems are fiber-reinforced polymer-matrix, there is also continued expansion into metal and ceramic matrices for targeted applications (e.g. elevated temperatures, high compression loads, unusual environments, etc.) Many of the implementation challenges have a common thread originating in either unknown material behavior or in the transition to manufacturing where large-scale or high rate processes are employed. Concurrently, new composite materials are continually evolving, holding promise for even better performance (and more challenges). These composite sessions will cover current work ranging from fundamental science and technology development to process development and fabrication, and include: matrix and reinforcement materials development, processing and process modeling, dimensional control, applications, defect management and detection, tooling methods, surface preparation, characterization (including microscopy and diffraction methods), cost and cost modeling, additive fabrication methods and cross-sector (commercial, defense, consumer and space) market transitions.

# EMERGING MATERIALS AND PROCESSES

Emerging materials and process technologies allow the aerospace industry to improve performance and affordability in all life-cycle phases of aerospace systems. These sessions will focus on new alloy developments and novel processing techniques across the range of aerospace materials.

# FAILURE ANALYSIS OF AEROSPACE COMPONENTS

Failure analysis has been used as a tool to enhance aviation safety throughout the decades. It draws on a variety of science and engineering disciplines in order to identify root causes and make recommendations to avoid repeat offenses. As materials, processes, and aircraft designs evolve, new methods combined with traditional practices are required to provide solutions to the aviation industry. This session will highlight a variety of recent cases with a special presentation on the future of aviation failure analysis.

# HIGH TEMPERATURE & TURBINE MATERIALS

High temperature materials and their advancement are often on the critical path for development of propulsion systems, aerospace vehicles, and gas turbines for power generation. While meeting performance and structural integrity requirements is essential, accelerating development of high temperature materials has meant an increased reliance on emerging Integrated Computational Materials Engineering (ICME) methods. Advances in alloys, ceramics, intermetallics and coatings for high temperature applications will be presented, with emphasis on how ICME has become enabling to cost-effective, rapid development and implementation.

# **SESSION DESCRIPTIONS**

# INTEGRATED COMPUTATIONAL MATERIALS ENGINEERING (ICME)

"Integrated Computational Materials Engineering" (ICME) methods, as enabled by industry and government efforts such as the "Materials Genome Initiative" (MGI), have garnered increased attention over the past several years. The AeroMat 2015 ICME session covers research related to the computational modeling and accelerated development of advanced new aerospace materials. Particular areas of interest include: (1) the development of process-structure and structure-property computational models and their integration into materials design practice; (2) the optimization of a materials' production or processing path; and (3) the rapid development and qualification of new aerospace materials including structural alloys, lightweight materials, castings, corrosion-resistant materials, high temperature materials and coatings. A broad range of talks, both from the research community and from the commercialization (industry) perspective, is envisioned.

# NON DESTRUCTIVE EVALUATION TECHNIQUES IN AEROSPACE

The significant developments in manufacturing, welding and joining and additive manufacturing processes in the last 15 years has led to even better non-destructive evaluation techniques to assist the aerospace industry. This session will review the following techniques: acoustic wave, laser ultrasonics, quantitative percussion diagnostics, phased array ultrasonics, full matrix capture and computed tomography, used to inspect a range of metallic and non-metallic material components for the airframe and aircraft engine market.

# SURFACE ENGINEERING AND FATIGUE LIFE ENHANCEMENT

Fatigue is involved in the majority of aerospace structural failures. In some applications, the fatigue requirements are greater than that which the material alone can provide. In these cases, fatigue life enhancement techniques are often employed. These techniques include surface microstructural modification, metallic coatings and methods to induce beneficial surface residual compressive stresses. The AeroMat 2015 Surface Engineering and Fatigue Life Enhancement session covers research and commercial advances based on these approaches.

# SUSTAINABILITY OF AEROSPACE MATERIALS & PROCESSES

These sessions aim to highlight and report on challenges in environmental sustainability particular to the aerospace industry, elucidate leading sustainable approaches and recommend best practices. Experts will share their knowledge and discuss design of materials and processes for improved recyclability, design for environment (DfE) and processing to recover manufacturing scrap and end of life (EoL) parts for new resources. Challenges in maintaining premium chemistry control and preventing impurity pickup and concentration are of special interest for high-performance aerospace alloys (magnesium, aluminum, titanium, ferrous alloys and superalloys). Similarly, methods of addressing fiber recovery from reinforced thermoplastics and thermoset polymer composites are highly desirable topics. Cost modeling and life cycle assessment likewise appropriate. The evolution and future of recycling methods, inline scrap characterization and control, and modern melting methods also fit well in this program. Other topics of interest include: renewable materials sources, biomaterials, EoL dismantling, aircraft DfE, and environmental legislation and controls.

# **TITANIUM ALLOY TECHNOLOGY**

These processing and metallurgy sessions will provide an update on the latest titanium aerospace technologies covering near-alpha, alpha/ beta and beta alloys across a wide range of topics and new developments. There is an interesting study on oxidation behavior of near-alpha alloys at 950C to further the understanding of this problem for high temperature applications and another study analyzing the effect of heat treatment and microstructure, including a2 formation, on mechanical properties. Other studies include analyses of the effects of thermomechanical processing and microstructure on the properties of several alpha-beta and beta alloys, use of hydrogen as a temporary alloying addition, powder processing and friction stir welding.

# WELDING AND JOINING

Welding technologies have been used in aircraft engine component manufacture for decades, but in more recent years there has been an increase in laser welding, friction welding and adhesive hybrid bonding for airframe manufacture in addition to the more conventional riveting technology. These technologies are continuing to develop and improve, and are being used for higher load applications, and in areas where dissimilar material joints are beneficial to the design for weight saving and performance requirements. The Welding sessions cover many areas of friction, power beam and fusion welding technologies, and adhesive hybrid bonding for a variety of aircraft and space applications.

# PROGRAM AT-A-GLANCE

	Monday May 11		Tue: Ma	sday y 12	Wedn Ma	Thursday May 14	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.
Additive Manufacturing	Additive Manufacturing I Room: 201A 8:00 a.m.– 12:00 p.m.		Additive Manufacturing II Room: 201A 8:00 a.m.– 11:00 a.m.	Additive Manufacturing III Room: 201A 4:00 p.m.– 5:30 p.m.	Additive Manufacturing IV Room: 201A 8:00 a.m.– 12:00 p.m.	Additive Manufacturing V Room: 201A 1:00 p.m.– 4:30 p.m.	
Advanced Aluminum Alloys- Light High Performance Alloys and Structures		Advanced Aluminum Alloys- Light High Performance Alloys and Structures I Room: 203A 3:30 p.m.– 5:30 p.m.	Advanced Aluminum Alloys- Light High Performance Alloys and Structures II Room: 203A 8:00 a.m.– 12:00 p.m.		Advanced Aluminum Alloys- Light High Performance Alloys and Structures III Room: 203A 8:30 a.m.– 11:30 a.m.		
Advanced Coatings for the Aerospace Industry (JOINT SYMPOSIUM with ITSC)	Suspension/ Solution and Plasma-Spray PVD TBCs - Novel TBC Materials Room: 102A 8:00 a.m.– 12:10 p.m.	Thermal Barrier Coatings (TBCs) Room: 102A 3:30 p.m.– 5:30 p.m.	Engineering, Protection and Repair of Aircraft Structural Parts 1 Room: 102A 8:00 a.m.– 11:30 a.m.	Engineering, Protection and Repair of Aircraft Structural Parts 2 Room: 102A 4:00 p.m.– 5:40 p.m.	Bond Coat Development forTBCs Room: 102B 8:00 a.m.– 9:40 p.m. Engineering, Protection and Repair of Aircraft Structural Parts 3 Room: 102A 8:00 a.m.– 10:00 a.m.	Engineering TBCs and Abradables Room: 102B 1:00 p.m.– 4:50 p.m. Engineering, Protection and Repair of Aircraft Structural Parts 4 Room: 102A 1:00 p.m.– 4:50 p.m.	Tribological, Oxidation, Corrosion Behavior of Aerospace- based Coatings Room: 102A 8:00 a.m 11:30 a.m.
Composite Materials and Structures	Composite Materials & Structures Room: 203A 8:00 a.m.– 11:30 a.m.						
Emerging Materials and Processes	Functional Coating Room: 202A 8:30 a.m.– 12:00 p.m.		Emerging Materials and Processes Room: 202A 8:00 a.m.– 11:30 a.m.	Recent Developments in Ferrous Alloys Room: 202A 4:00 p.m.– 5:30 p.m.			
Failure Analysis of Aerospace Components						Failure Analysis of Aerospace Components Room: 202A 1:00 p.m.– 3:00 p.m.	
High Temperature and Turbine Materials	High Temperature and Turbine Materials I Room: 202B 8:00 a.m.– 11:30 a.m.	High Temperature and Turbine Materials II Room: 202B 3:30 p.m.– 5:30 p.m.			High Temperature and Turbine Materials III Room: 202B 8:00 a.m.– 11:30 a.m.		

# PROGRAM AT-A-GLANCE

	Monday May 11		Tues Maj	Tuesday May 12		Wednesday May 13	
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.
Integrated Computational Materials Engineering (ICME)	Integrated Computational Materials Engineering (ICME) I Room: 201B 8:30 a.m.– 11:30 a.m.	Integrated Computational Materials Engineering (ICME) II Room: 201B 3:30 p.m.– 5:00 p.m.					
Non Destructive Evaluation Techniques in Aerospace			Non Destructive Evaluation Techniques in Aerospace Room: 202B 8:00 a.m.– 12:00 p.m.				
Plenary		Exhibit Halls A&B 1:30 p.m.– 3:00 p.m.		Exhibit Halls A&B 1:00 p.m.– 3:30 p.m.			
Surface Engineering and Fatigue Life Enhancement					Surface Engineering and Fatigue Life Enhancement Room: 202C 8:00 a.m.– 11:30 a.m.		
Sustainability of Aerospace Materials & Processes					Sustainability of Aerospace Materials & Processes Room: 201B 8:00 a.m.– 10:00 a.m.		
Titanium Alloy Technology			Titanium Alloy Technology I Room: 201B 8:00 a.m.– 11:30 a.m.			Titanium Alloy Technology II Room: 201B 1:00 p.m.– 4:30 p.m.	
Welding and Joining	Welding and Joining I Room: 202C 8:00 a.m.– 10:00 a.m.	Welding and Joining II Room: 202C 4:00 p.m.– 5:30 p.m.	Welding and Joining III Room: 202C 8:00 a.m.– 11:30 a.m.				

# **PROGRAM AT-A-GLANCE**

# **NETWORKING OPPORTUNITIES**

Monday	
Morning Refreshment Break	10:00 a.m10:30 a.m., Meeting Space Foyer
Lunch	12:00 p.m.–1:15 p.m., Exhibit Halls A&B
Afternoon Refreshment Break	3:00 p.m.–3:30 p.m., Exhibit Halls A&B
Expo Welcome Reception	5:30 p.m.–7:00 p.m., Exhibit Halls A&B
Tuesday	
Morning Refreshment Break	10:00 a.m.–10:30 a.m., Exhibit Halls A&B
Lunch	12:00 p.m.–1:00 p.m., Exhibit Halls A&B
Afternoon Refreshment Break	3:30 p.m.–4:00 p.m., Exhibit Halls A&B
Social Event*	7:00 p.m.–10:00 p.m., Queen Mary
Wednesday	
Morning Refreshment Break	10:00 a.m.–10:30 a.m., Exhibit Halls A&B
Allied Facility Tour	10:45 a.m.–1:15 p.m., departing from Hyatt Regency. Preregistration required.
Afternoon Refreshment Break	3:00 p.m.–3:30 p.m., Exhibit Halls A&B
Thursday	
Morning Refreshment Break	10:00 a.m.–10:30 a.m., Meeting Space Foyer

\*Ticket Sold Separately

# **EXPOSITION HOURS/ACTIVITIES**

Monday	12:00 p.m.–7:00 p.m.
V.I.P. Expo Tour	10:15 a.m.–11:15 a.m. (qualified attendees were notified regarding acceptance.)
Lunch	12:00 p.m.–1:00 p.m.
Plenary	1:30 p.m.–3:00 p.m.
Refreshment Break	3:00 p.m.–3:30 p.m.
Welcome Reception	5:30 p.m.–7:00 p.m.
Tuesday	9:00 a.m4:00 p.m.
Refreshment Break	10:00 a.m10:30 a.m.
AeroMat Plenary	10:30 a.m12:00 p.m.
Lunch	12:00 p.m.–1:00 p.m.
Plenary	1:00 p.m.–3:30 p.m.
Refreshment Break	3:30 p.m4:00 p.m.
Wednesday	9:00 a.m4:00 p.m.
Refreshment Break	10:00 a.m10:30 a.m.
Refreshment Break	3:00 p.m.–3:30 p.m.

Lunches provided Monday and Tuesday on the Exhibit Floor. Attenees on own for lunch Wednesday

# **EDUCATION SHORT COURSES**

#### Thursday, May 14th at the Hyatt Regency Long Beach

Additive Manufacturing Systems

Friction Stir Welding & Processing

See page 42 for course description

Education Short Course Registration opens at 8:00 a.m. in the Seaview Foyer at the Hyatt Regency Long Beach

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

On behalf of ASM International<sup>®</sup>, we would like to thank the Organizing Committee, Champions, Session Chairs, and Speakers for their time and efforts in creating an outstanding AeroMat Conference and Exposition.

Abstracts can be found online at asminternational.org. See page 3 for download instructions.

# Monday, May 11, 2015

#### Additive Manufacturing I 8:00 a.m.–12:00 p.m. Meeting Room: 201A

#### **Session Chair:**

Mr. Hank Phelps Lockheed-Martin Marietta, GA USA

#### 8:00 a.m.

**Prediction of Bulk Residual Stresses in Electron Beam Additive Manfuactured Aluminium Alloy:** Mr. Florent Peillon, **Dr. Vu Nguyen**, Dr. Yuqing Feng and Dr. Sri Lathabai, CSIRO, Clayton South, Victoria, Australia

#### 8:30 a.m.

**Further Development of a Predictive Tool for Managing Distortion in Electron Beam Additive Manufacturing: Dr. Vu Nguyen**<sup>1</sup>, Dr. Yuqing Feng<sup>1</sup>, Dr. Sri Lathabai<sup>1</sup>, Mr. John Barnes<sup>1</sup> and Mr. Gary Coleman<sup>2</sup>, <sup>1</sup>CSIRO, Clayton South, Victoria, Australia, <sup>2</sup>Metallics—Welding and Forming, Boeing Research & Technology, Seattle, WA

#### 9:00 a.m.

An integrated Global/Local Optimization Framework for Subsonic Wing with Ribs having Holes: Mr. Shuvodeep De<sup>1</sup>, Dr. Qiang Liu<sup>2</sup>, Mr. Mohamed Jrad<sup>1</sup> and Prof. Rakesh K. Kapania<sup>2</sup>, <sup>1</sup>Engineering Science and Mechanics, Virginia Polytechnic Institute and State University, Blacksburg, VA, <sup>2</sup>Aerospace and Ocean Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA

#### 9:30 a.m.

Simulation and Characterization of Electron Beam Additive Manufacturing Ti-6Al-4V: Ms. Jun Cao, Prof. Philip Nash and Mr. Ming Yin, Illinois Institute of Technology, Chicago, IL

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

**Damage Tolerance Study of Curvilinearly Stiffened Panels: Mrs. Nihal El Bourkadi<sup>1</sup>** and Mr. Mohamed Jrad<sup>2</sup>, <sup>1</sup>Visitor student at Virginia Tech, asnieres sur seine, France, <sup>2</sup>Engineering Science and Mechanics, Virginia Polytechnic Institute and State University, Blacksburg, VA

#### 11:00 a.m.

Minimizing Residual Stresses in Gamma-TiAl Produced by Electron Beam Melting Process: Dr. Ashfaq Mohammad, Mr. Muneer Khan Mohammed, Prof. Abdulrahman AlAhmari, Abdullah AlFaify and Abdulrahman Alomar, FARCAMT, Advanced Manufacturing Institute, King Saud University, Riyadh, Saudi Arabia

#### 11:30 a.m.

Study on Interface Temperature and Plastic Strain During Ultrasonic Consolidation Process and their Influence of on Bonding Strength: Mr. Song Zhang<sup>1</sup>, Prof. Hui Zhang<sup>2</sup>, Prof. Lili Zheng<sup>3</sup>, Ms. Xiaohua He<sup>1</sup>, Prof. Huiji Shi<sup>1</sup> and Prof. Zhigang Yang<sup>4</sup>, <sup>1</sup>Department of Engineering Mechanics, Tsinghua University, Beijing, China, <sup>2</sup>Department of Engineering Physics, Tsinghua University, Beijing, China, <sup>3</sup>School of Aerospace Engineering, Tsinghua University, Beijing, China, <sup>4</sup>Department of Material Science and Engineering, Tsinghua University, Beijing, China

> 12:00 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

#### Composite Materials & Structures 8:00 a.m.–11:30 a.m. Meeting Room: 203A

#### **Session Chair:**

Mr. Mark Rogalski Boeing Commercial Airplanes Everett, WA USA

#### 8:00 a.m.

Degradation Monitoring of Fatigued Notched Carbon Fiber Composites using DIC and Modal Techniques: Mr. Bilel Aidi and Prof. Scott W. Case, Biomedical Engineering and Mechanics, Virginia Tech, Blacksburg, VA

#### 8:30 a.m.

**Characterization of Carbon Fiber Reinforced Thermoplastics for Induction Processing: Mr. John Jackowski**, Dr. Valentin Nemkov and Mr. Robert C. Goldstein, Fluxtrol Incorporated, Auburn Hills, MI

#### 9:00 a.m.

Study of Fiber Pull-Out Characterization in Drilling Carbon Fiber Reinforced Polymers: Mr. Sina Alizadeh Ashrafi and Dr. Dave Kim, Washington State University Vancouver, Vancouver, WA

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#### 9:30 a.m.

The Multi-Scale Modeling of Failure of Continuous Fiber Composites for Virtual Allowables: Mr. Robert Schmitz<sup>1</sup>, Mr. Philippe Hebert<sup>2</sup> and Dr. Benoit Bidaine<sup>2</sup>, <sup>1</sup>e-Xstream Engineering, Denver, CO, <sup>2</sup>e-Xstream Engineering, Mont-Saint-Guibert, Belgium

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

An Overview of the NASA Composite, Liquid Hydrogen Cryotank Technologies and Demonstration: Mr. Robert Boucher, Mr. Daniel E. Rivera, The Boeing Company, Boeing Research and Technology, Huntington Beach, CA

#### 11:00 a.m.

Quantitative Full Survey Chemical Analysis and Distribution Measurement of Impurities in Novel Ceramic Matrix Composites: Dr. Xinwei Wang, Dr. Karol Putyera and Mr. Christian Iversen, EAG—NY, Evans Analytical Group LLC., Liverpool, NY

> 12:00 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

High Temperature and Turbine Materials I 8:00 a.m.–11:30 a.m. Meeting Room: 202B

#### **Session Chair:**

Mr. Eli Ross UTC Pratt & Whitney East Hartford, CT USA

#### 8:00 a.m.

**The Ever-Changing, Never-Ending Nature of Superalloy Development: Dr. John de Barbadillo**, Research and Development, Special Metals, Huntington, WV

#### 8:30 a.m.

Effects of Prior Inelastic Strain and Stress Concentrations on Fatigue Crack Nucleation and Propagation Behavior in High Pressure Turbine Disc Materials: Mr. Robert Warren, Institute of Structural Materials, Swansea University, Swansea, United Kingdom

#### 9:00 a.m.

**Considerations in the Fatigue Lifing of a High Strength Nickel Alloy: Ms. Emily Duffy**<sup>1</sup>, MT Whittaker<sup>1</sup>, N Barnard<sup>1</sup>, B Cockings<sup>1</sup> and T Hyde<sup>2</sup>, <sup>1</sup>College of Engineering, Institute of Structural Materials, Swansea, United Kingdom, <sup>2</sup>Rolls Royce plc, Derby, United Kingdom

#### 9:30 a.m.

**Evolution and Stability of the Two-Phase** γ-γ' **Microstructure in Co-Al-W Alloys: Dr. Eric Lass**, National Institute of Standards and Technology, Gaithersburg, MD

10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

Solid State Synthesis and Characterization of Mixed Rare Earth Hexaaluminates: Dr. Armen Kuzanyan<sup>1</sup>, Dr. Karine Hovhannesyan<sup>2</sup>, Georgi Badalyan<sup>1</sup>, Dr. Atom Yeganyan<sup>2</sup>, Prof. Ashot Petrosyan<sup>2</sup> and Prof. Vassilis Stathopoulos<sup>3</sup>, <sup>1</sup>MS, Institute for Physical Research, National Academy of Sciences, Ashtarak, Armenia, <sup>2</sup>LSM, Institute for Physical Research, National Academy of Sciences, Ashtarak, Armenia, <sup>3</sup>Department of Electrical Engineering, Technological Educational Institute of Sterea Ellada, Psachna Chalkida, Greece

#### 11:00 a.m.

High Temperature Oxidation/Sulfidation of Superalloy Haynes 230: Mr. Manuel Lira<sup>1</sup>, Dr. Facundo Almeraya Calderon<sup>1</sup>, Dr. Patricia Zambrano Robledo<sup>1</sup>, Dr. Citlalli Gaona Tiburcio<sup>2</sup> and Dr. Alberto Martinez Villafañe<sup>3</sup>, <sup>1</sup>Universidad Autonoma de Nuevo Leon, San Nicolas de los Garza, Mexico, <sup>2</sup>Corrosion, Centro de Investigación e Innovación en ingeniería Aeronáutica-FIME-UANL, Apodaca N.L., Mexico, <sup>3</sup>Metalurgia, Centro de Investigacion en Materiales avanzados, Chihuahua, Mexico

> 12:00 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

Suspension/Solution and Plasma-Spray PVD TBCs–Novel TBC Materials 8:00 a.m.–12:10 p.m. Meeting Room: 102A

#### **Session Chairs:**

Dr. Rogerio S. Lima National Research Council of Canada (NRC) Boucherville, QC Canada

> Mr. Brian Hazel Pratt & Whitney USA East Hartford, CT USA

#### 8:00 a.m.

**Columnar Suspension Plasma Spray Thermal Bar rier Coatings: Influence of Suspension Properties and Bond Coat Preparation: Dr. Nicholas Curry**<sup>1</sup>, Dr. Kent VanEvery<sup>2</sup>, Mr. Johann Susnjar<sup>1</sup>, Mr. Stefan Björklund<sup>3</sup> and Todd Snyder<sup>2</sup>, <sup>1</sup>Research and Development, Treibacher Industrie AG, Althofen, Austria, <sup>2</sup>Progressive Surface, Grand Rapids, MI, <sup>3</sup>University West, Trollhattan, Sweden

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

#### 8:20 a.m.

Solution Precursor Plasma Spray of Yttrium Aluminum Garnet Thermal Barrier Coatings: Dr. Eric Jordan<sup>1</sup>, Dr. Maurice Gell<sup>1</sup>, Dr. jiwen wang<sup>2</sup>, Chen Jiang<sup>1</sup>, Mr. Jeffrey roth<sup>1</sup> and Mr. Rishi kumar<sup>3</sup>, <sup>1</sup>School of Mechanical Engineering, The University of Connecticut, Storrs, CT, <sup>2</sup>Hifunda LLC, Storrs, CT, <sup>3</sup>MSE, University of Connecticut, storrs, CT

#### 8:40 a.m.

**Process-Structure-Property Relationships in Advanced Thermal Barrier Coatings (TBC) Fabricated via Plasma Spray – Physical Vapor Deposition (PS-PVD): Mr. Michael P. Schmitt<sup>1,2</sup>, Dr. Bryan J. Harder<sup>3</sup> and Dr. Douglas E. Wolfe<sup>1,2</sup>, <sup>1</sup>Materials Science and Engineering, The Pennsylvania State University, University Park, PA, <sup>2</sup>The Applied Research Laboratory, The Pennsylvania State University Park, PA, <sup>3</sup>Environmental Effects and Coatings (LME), NASA Glenn Research Center, Cleveland, OH** 

#### 9:00 a.m.

Thermal Barrier Coatings Performed by Suspension Plasma Spraying: Development and Characterization: Mr. Benjamin BERNARD<sup>1,2</sup>, Dr. Luc BIAN-CHI<sup>1</sup>, Mr. André MALIE<sup>3</sup>, Dr. Vincent SCHICK<sup>2</sup> and Dr. Benjamin REMY<sup>2</sup>, <sup>1</sup>CEA DAM, Monts, France, <sup>2</sup>Laboratoire d'Energétique et de Mécanique Théorique et Appliquée (LEMTA/CNRS), Vandœuvre-lès-Nancy Cedex, France, <sup>3</sup>Safran Snecma, Châtellerault cedex, France

#### 9:20 a.m.

Thermal Transport Properties of Columnar Structured Zirconia Coatings Deposited by Suspension Plasma Spraying Method: Prof. Lech Pawlowski<sup>1</sup>, Mr. Pawel Sokolowski<sup>1</sup>, Dr. Dagmar Dietrich<sup>2</sup>, Prof. Thomas Lampke<sup>3</sup>, Dr. Leszek Latka<sup>4</sup> and Mr. David Jech<sup>5</sup>, <sup>1</sup>SPCTS, University of Limoges, Limoges, France, <sup>2</sup>Technical University of Chemnitz, Chemnitz, Germany, <sup>3</sup>Chemnitz University of Technology, Chemnitz, Germany, <sup>4</sup>University of Limoges, Limoges, France, <sup>5</sup>Brno University of Technology, Brno, Czech Republic

#### 9:40 a.m.

This is In Situ Synthesis of  $\alpha$ -Alumina Layer Against CMAS (CaO-MgO-Al2O3-SiO2) Corrosion in Thermal Barrier Coatings Prepared by PS-PVD Case: Prof. Ke-Song Zhou and Mr. Xiao-Feng Zhang, New materials institute, Guangdong General Research Institute of Industrial Technology (Guangzhou Research Institute of Non-ferrous Metals), GuangZhou, China

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

**Evaluating Conditions for Manufacturing Suspension Plasma TBCs: Dr. Kent VanEvery**, Progressive Surface, Grand Rapids, MI

#### 10:50 a.m.

Axial Suspension Plasma Sprayed Thermal Barrier Coatings: Dr. Zhaolin Tang<sup>1</sup>, G Masindo<sup>1</sup>, D Barentzen<sup>2</sup> and Z Celler<sup>1</sup>, <sup>1</sup>Northwest Mettech Corp., North Vancouver, BC, Canada, <sup>2</sup>Northwest Mettech Corp., North Vancovuer, BC, Canada

#### 11:10 a.m.

Internal Stresses in Ytterbium Disilicate Multilayer Environmental Barrier Coatings With Calcium-Magnesium-Aluminosilicate Exposure: Dr. Fabian Stolzenburg<sup>1</sup>, Dr. Peter Kenesei<sup>2</sup>, Dr. Jonathan Almer<sup>2</sup>, Dr. Kang Lee<sup>3</sup> and **Prof. Katherine Faber**<sup>1</sup>, <sup>1</sup>Northwestern University, Evanston, IL, <sup>2</sup>Argonne National Laboratory, Argonne, IL, <sup>3</sup>Rolls-Royce Corporation, Indianapolis, IN

#### 11:30 a.m.

Preparation and Characterization of Lanthanum Zirconate by Atmospheric Plasma Spray Coatings: Mr. Sivakumar Sankaran, Mr. Praveen Kandasamy and Dr. Gurusamy Shanmugavelayutham, Bharathiar university, Coimbatore, IA, India

#### 11:50 a.m.

Synthesis Of Rare Earth Aluminates From Pseudoboehmite And Oxides: Mr. wilson Hernández, UMSNH, Morelia, Mexico

12:10 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

Welding and Joining I 8:00 a.m.–10:00 a.m. Meeting Room: 202C

#### Session Chair:

**Mr. Fernando Fernandez** *Embraer* São José dos Campos, Brazil

#### 8:00 a.m.

**Bond PTFE and Metals Together: Dr. Lei Wang**, Dr. Chris Yun and Mr. Petter Dutton, Aerospace, Defense & Marine, TE Connectivity, Menlo Park, CA

#### 8:30 a.m.

**Development of Friction Stir Welding of Titanium Alloys for Spacecraft Propellant Tanks: Dr. Richard Freeman**<sup>1</sup>, Dr. M. J. Russell<sup>2</sup>, Mr. A. Norman<sup>3</sup> and Dr. Tommaso Ghidini<sup>4</sup>, <sup>1</sup>TWI Ltd, Cambridge, United Kingdom, <sup>2</sup>Friction & Forge Processes Group, TWI Ltd, Cambridge, United Kingdom, <sup>3</sup>European Space

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

Agency (ESA), Noordwijk, Netherlands, <sup>4</sup>Materials Technology Section at European Space Agency, Noordwijk, Netherlands

#### 9:00 a.m.

Influence of the Pin Shape on the Flow Characteristics of the Plasticity Metal in the Friction Stir Welded Al-Alloy: Prof. Li Xing, Mr. Chaoying Yan and Prof. liming ke, NanChang HangKong University, NanChang, JiangXi, China

#### 9:30 a.m.

Linear Friction Welding (LFW) of Aircraft Structural Components in High Strength Aluminium Alloys: Dr. Richard Freeman<sup>1</sup>, Dr. M. J. Russell<sup>2</sup> and Mr. Dick Andrews<sup>2</sup>, <sup>1</sup>TWI Ltd, Cambridge, United Kingdom, <sup>2</sup>Friction & Forge Processes Group, TWI Ltd, Cambridge, United Kingdom

10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

> Functional Coatings 8:30 a.m.–12:00 p.m. Meeting Room: 202A

Session Chair: Mr. Brian Boyette NAVAIR Cherry Point, NC USA

#### 8:30 a.m.

Beaker to Bomber – Computational Modeling Reduces Technical and Commercial risk in Transitioning Promising Coating Technologies from the Laboratory to Full Scale: Dr. Alan Rose and Dr. Keith Legg, Corrdesa LLC, Newnan, GA

#### 9:00 a.m.

Fatigue Response of Common Conversion Coatings on Al7075: Mrs. Molly Walters<sup>1</sup>, Dr. Kumar Jata<sup>2</sup>, Mr. W. John Porter<sup>1</sup> and Dr. Dennis J. Buchanan<sup>1</sup>, <sup>1</sup>University of Dayton Research Institute, Dayton, OH, <sup>2</sup>Materials & Manufacturing Directorate, AFRL/ RXCM, Wright-Patterson AFB, OH

#### 9:30 a.m.

Tantalum Diffusion Layer for Extremely Corrosive Environments: Dr. Jacob J. Stiglich, Mr. Dean Gambale and Mr. Brian Williams, Ultramet, Pacoima, CA

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

**Virtual Design of Inhibited Primers:** Prof. Ivan Cole<sup>1</sup>, Dr. Erik Sapper<sup>2</sup> and **Dr. Joseph Osborne**<sup>3</sup>, <sup>1</sup>CSIRO, Melbourne, Australia, <sup>2</sup>Boeing Research & Technology, St. Louis, MO, <sup>3</sup>Boeing Research & Technology, Seattle, WA

#### 11:00 a.m.

**Evaluation of Corrosion Resistance of Thin Films Used in the Aeronautical Industry Deposited by Sputtering: Mrs. Jamnie Yazmín Achem Calahorra**<sup>1</sup>, Dr. José Ángel Cabral Miramontes<sup>1</sup>, Dr. Facundo Almeraya Calderón<sup>2</sup> and Dr. Citlalli Gaona Tiburcio<sup>2</sup>, <sup>1</sup>Universidad Autónoma de Nuevo León, Apodaca N.L., Mexico, <sup>2</sup>Corrosion, Centro de Investigación e Innovación en ingeniería Aeronáutica-FIME-UANL, Apodaca N.L., Mexico

#### 11:30 a.m.

**Coating Effect on High Strength Steels: Dr. Eun U. Lee**, Navy, Naval Air Warfare Center Aircraft Division, Patuxent River, MD

> 12:00 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

Integrated Computational Materials Engineering (ICME) I 8:30 a.m.–11:30 a.m. Meeting Room: 201B

#### **Session Chair:**

**Dr. Jason Sebastian** *QuesTek Innovations, LLC Evanston, IL USA* 

#### 8:30 a.m.

Utilizing ICME Models to More Effectively Predict Process-Structure-Property Relationships for Better Property Optimization and Design in Aerospace Alloys: Mrs. Ashley Goulding<sup>1</sup> and Dr. Richard W. Neu<sup>2</sup>, <sup>1</sup>School of Materials Science and Engineering, Georgia Institute of Technology, Atlanta, GA, <sup>2</sup>The George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA

#### 9:00 a.m.

**ICME Aids Aluminum Product Development at Alcoa: Dr. Lynne M. Karabin**, Dr. Wei Wang, Dr. Alvaro Giron, Dr. Patrick Ulysse, Dr. Jacob Kallivayalil, Dr. Jay Goodman and Dr. John Brockenbrough, Alcoa Technical Center, Alcoa Center, PA

#### 9:30 a.m.

**Through-Process Modeling for Alloy Design and Process Optimization for Cold Spray: Dr. Danielle Belsito**<sup>1</sup>, Ms. Baillie McNally<sup>1</sup>, Dr. Richard Sisson, Jr.<sup>1</sup> and Mr. Victor K. Champagne<sup>2,3</sup>, <sup>1</sup>Materials Science and Engineering, Worcester Polytechnic Institute, Worcester, MA, <sup>2</sup>ARL Center for Cold Spray, US Army research Laboratory, Aberdeen, MD, <sup>3</sup>U.S. Army Research Laboratory, Aberdeen Proving Ground, MD

10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

#### 10:30 a.m.

Integrated Computational Materials Design (ICME) of Co-based Cu-Be Alternative for Aerospace Bushing Applications: Mr. David Snyder, Dr. Jiadong Gong, Dr. James Saal and Dr. Jason Sebastian, QuesTek Innovations, LLC, Evanston, IL

#### 11:00 a.m.

Trends in Segregation Energies and their Application to Embrittlement and Creep: Mr. Michael A. Gibson and Christopher A. Schuh, Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA

> 12:00 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

Monday Plenary Session 1:30 p.m.–3:00 p.m. Exhibit Halls A&B

#### 1:30 p.m.

**Dr. John Grotzinger**, Chief Scientist and Head of Strategic Planning for the Mars Rover Mission

3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

Advanced Aluminum Alloys-Light High Performance Alloys and Structures I 3:30 p.m.–5:30 p.m. Meeting Room: 203A

#### **Session Chair:**

**Mr. Roy Nash** Kaiser Aluminum Spokane, WA USA

#### 3:30 p.m.

High Performance Alcoa Thick Gauge Products for Next-Generation Aircraft: Dr. Julien Boselli<sup>1</sup>, Ms. Diana Denzer<sup>1</sup>, Dr. Lynne M. Karabin<sup>1</sup>, Dr. Gary Bray<sup>1</sup>, Dr. Jay Goodman<sup>1</sup>, Ms. Heather Watson<sup>2</sup>, Ms. Ellahe-Naz Farhangnia<sup>3</sup>, Dr. Carolyn Small<sup>3</sup> and Mr. Gregory Venema<sup>4</sup>, <sup>1</sup>Alcoa Technical Center, Alcoa Center, PA, <sup>2</sup>Alcoa Forged Products, AFE, Cleveland, OH, <sup>3</sup>Alcoa Inc, Birmingham, United Kingdom, <sup>4</sup>Alcoa Inc, Davenport, IA

#### 4:00 p.m.

New KaiserSelect<sup>®</sup> Products for Aerospace Applications: Mr. Jason Scheuring, Dr. Philippe Gomiero, Dr. Zhengdong (Steven) Long, Dr. Florence Baldwin and Mr. Roy Nash, Research and Development, Kaiser Aluminum, Spokane, WA

#### 4:30 p.m.

**Novel Wing Cover Solutions for Commercial Aircraft: Mr. Tristan Crawford**<sup>1</sup>, Dr. Timothy Warner<sup>1</sup>, Ms. Gaëlle Pouget<sup>2</sup>, N Bayona-Carrillo<sup>1</sup> and A. Bigot<sup>1</sup>, <sup>1</sup>CRV, Constellium LLC, Voreppe, France, <sup>2</sup>Constellium Research Center, Voreppe, France

#### 5:00 p.m.

**Development of Al-Li 2050 and 2195 forgings at Weber Metals: Dr. Tony Yao**<sup>1</sup>, Mr. Mark Timko<sup>1</sup> and Mr. Michael Niedzinski<sup>2</sup>, <sup>1</sup>Metallurgy, Weber Metals, Paramount, CA, <sup>2</sup>Constellium, South Barrington, IL

5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

High Temperature and Turbine Materials II 3:30 p.m.–5:30 p.m. Meeting Room: 202B

> Session Chair: Dr. John Foltz ATI Albany, OR USA

#### 3:30 p.m.

**Life Prediction Model of Air Plasma Sprayed Thermal Barrier Coatings: Dr. Prakash Patnaik**<sup>1</sup> and Dr. Kuiying Chen<sup>2</sup>, <sup>1</sup>Gas Turbine Laboratory, National Research Council Canada, Ottawa, ON, Canada, <sup>2</sup>Structures, Materials and Manufacturing Laboratory, National Research Council Canada, Ottawa, ON, Canada

#### 4:00 p.m.

Investigation of Cold Sprayed Bond Coat: Microstructure and Oxidation Behavior: Dr. Mo Yandouzi<sup>1</sup>, Mr. Deliang Guo<sup>2</sup> and Prof. Bertrand Jodoin<sup>1</sup>, <sup>1</sup>Mech. Eng., University of Ottawa (uOttawa), Ottawa, ON, Canada, <sup>2</sup>Mech. Eng., University of Ottawa, Ottawa, ON, Canada

#### 4:30 p.m.

**Integrated Computational Materials Engineering Development of High-Strength Molybdenum Alloys with Improved Ductility: Dr. Jason Sebastian**, Mr. David Snyder, Prof. Gregory Olson and Mr. Jeff Grabowski, QuesTek Innovations, LLC, Evanston, IL

#### 5:00 p.m.

**Thermal History Paint for Temperature Profiling of Critical Components: Dr. Christopher Pilgrim**, Dr. Jörg Feist, Mr. Stéphane Berthier, Ms. Silvia Araguas and Dr. Shilpi Karmakar Biswas, Sensor Coating Systems Ltd., London, United Kingdom

5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B • 25

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

#### Integrated Computational Materials Engineering (ICME) II 3:30 p.m.–5:00 p.m. Meeting Room: 201B

#### **Session Chair:**

**Dr. Gary Bray** Alcoa Technical Center Alcoa Center, PA USA

#### 3:30 p.m.

Design, Qualification and Deployment of Computationally Designed Ferrium Alloys: Mr. Jeff Grabowski, Dr. Jason Sebastian and Prof. Gregory Olson, QuesTek Innovations, LLC, Evanston, IL

#### 4:00 p.m.

**MedeA—An Atomistic Simulation Environment for ICME: Dr. Clive Freeman**<sup>1</sup>, Dr. Erich Wimmer<sup>2</sup> and Dr. Paul Saxe<sup>1</sup>, <sup>1</sup>Materials Design, Inc., Angel Fire, NM, <sup>2</sup>Materials Design, SARL, Montrouge, France

#### 4:30 p.m.

A Software Architecture for Managing the Material Information Data Streams, Test Data and Model Predictions, Evident in Successful ICME Implementations: Dr. Will Marsden, Granta Design, Cambridge, United Kingdom

> 5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

Thermal Barrier Coatings (TBCs) 3:30 p.m.–5:30 p.m. Meeting Room: 102A

#### **Session Chair:**

Dr. Rogerio S. Lima National Research Council of Canada (NRC) Boucherville, QC Canada

#### 3:30 p.m.

Improving the Corrosion Resistance of Thermal Barrier Coatings against CMAS by Depositing top ceramic layer of Enhanced Splat Bonding: Mr. Tao Liu, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li, Dr. Xiao-Tao Luo and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

#### 3:50 p.m.

Laser Surface Texturing Pretreatment Before Thermal Spraying—A Way to Adapt and Control The Surface Topography to the Considered Materials and the Stresses Imposed: Mr. Robin Kromer<sup>1</sup>, Dr. Sophie Costil<sup>1</sup>, Dr. Jonathan cormier<sup>2</sup>, Dr. Laurent Berthe<sup>3</sup>, Dr. Patrice peyre<sup>3</sup> and Mr. Damien courapied<sup>3</sup>, <sup>1</sup>IRTES-LERMPS institute, Belfort cedex, France, <sup>2</sup>Département de Physique et Mécanique des Matériaux, Institut P', CHASSENEUIL, France, <sup>3</sup>Laboratoire Procédés et Ingénierie en Mécanique et Matériaux, Arts&Métiers ParisTech, Paris, France

#### 4:10 p.m.

Concept Optimization for Coating Application and Quality of APS applied TBC on Gas Turbine Blades and Vanes: Dr. Thomas Duda and Mr. Tobias Buecklers, Alstom (Switzerland), Birr, Switzerland

#### 4:30 p.m.

**Thermal Phase Stability of Various Plasma Sprayed TBCs: Dr. Li Li**<sup>1</sup> and Dr. Benjamin Peterson<sup>2</sup>, <sup>1</sup>Praxair Surface Technologies, Inc., Indianapolis, IN, <sup>2</sup>Honeywell Aerospace, Phoenix, AZ

#### 4:50 p.m.

Novel High Sintering-Resistant Plasma-sprayed Thermal Barrier Coatings with Designed Large Two-Dimensional Inter-lamellar Voids: Dr. Tao Liu, Mr. Shan-Lin Zhang, Dr. Xiao-Tao Luo, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li and **Prof. Chang-Jiu Li**, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

#### 5:10 p.m.

**Thermal Gradient Behaviour of TBCs Subjected to a Laser Gradient Test Rig: Simulating an Air-to-Air Combat Flight: Dr. Rogerio S. Lima**<sup>1</sup>, Dr. Basil R. Marple<sup>1</sup> and Mr. Pierre Marcoux<sup>2</sup>, <sup>1</sup>National Research Council of Canada (NRC), Boucherville, QC, Canada, <sup>2</sup>Vac Aero International, Boucherville, QC, Canada

5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

> Welding and Joining II 4:00 p.m.–5:30 p.m. Meeting Room: 202C

#### **Session Chair:**

Dr. Richard Freeman TWI Ltd Cambridge, United Kingdom

#### 4:00 p.m.

Damage Tolerance Analysis of Dissimilar Butt-Joints Obtained by Stationary Shoulder Friction Stir Welding: Mr. Alessandro Barbini<sup>1</sup>, Dr. Jorge F. dos Santos<sup>1</sup> and Prof. Norbert Huber<sup>2</sup>, <sup>1</sup>Solid-State Joining Processes, Helmholtz-Zentrum Geesthacht GmbH, Institute of Materials Science, Materials Mechanics, Geesthacht, Germany, <sup>2</sup>Helmholtz-Zentrum Geesthacht GmbH, Institute of Materials Science, Materials Mechanics, Geesthacht, Germany

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

#### 4:30 p.m.

Manufacturing of a Novel Upper Wing Cover Demonstrator Using Friction Stir Welding: Dr. Frank Eberl<sup>1</sup>, Mr. K. Paul Smith<sup>2</sup>, Mr. Julien Laye<sup>1</sup>, Mr. Fernando Fernandez<sup>3</sup>, Mrs. Danielle Nunes<sup>3</sup>, Mr. Marcio Cruz<sup>4</sup>, Mr. Marcos Miyazaki<sup>5</sup>, Mr. G. Aleixo<sup>3</sup>, Mr. Rafael Sanchez<sup>6</sup> and Mr. Jose-Luis Garcia<sup>6</sup>, <sup>1</sup>Constellium LLC, Issoire Cedex, France, <sup>2</sup>Constellium LLC, Ravenswood, France, <sup>3</sup>R & D, Embraer, São José dos Campos, Brazil, <sup>4</sup>Manufacturing Engineer, Embraer, Sao Jose dos Campos, Brazil, <sup>5</sup>Helmholtz-Zentrum Geesthacht GmbH, Institute of Materials Science, Materials Mechanics, Geesthacht, Germany, <sup>6</sup>AERN-NOVA, S.A.U., Tarazona, Spain

#### 5:00 p.m.

Aluminum Tailor Welded Blanks – Preparing for High Volume Production: Mr. Yuri Hovanski<sup>1</sup>, Dr. Piyush Upadhyay<sup>1</sup>, Mr. Brandon landino<sup>2</sup>, Mr. Mark Eisenmenger<sup>3</sup> and Dr. John Carsley<sup>4</sup>, <sup>1</sup>Applied Material Processing, Pacific Northwest National Laboratory, Richland, WA, <sup>2</sup>Global Aerospace, Transportation, & Industrial Rolled Products, Alcoa Inc. -, Farmington Hills, MI, <sup>3</sup>TWB Company LLC., Monroe, MI, <sup>4</sup>GM Global R&D, Warren, MI

> 5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

# **Tuesday, May 12, 2015**

Additive Manufacturing II 8:00 a.m.–11:00 a.m. Meeting Room: 201A

**Session Chair:** 

**Dr. Francisco Medina** Arcam Naperville, IL USA

#### 8:00 a.m.

Material Properties of AS7G06 Aerospace Components Built Using Selective Laser Melting: Dr. Stephanie Giet<sup>1</sup>, Mr. Heng Rao<sup>2</sup>, Dr. Paul Rometsch<sup>3</sup> and Prof. Xinhua Wu<sup>1,4</sup>, <sup>1</sup>Monash Centre for Additive Manufacturing, Notting Hill, Australia, <sup>2</sup>Mechanical and Aerospace Engineering, Monash University, Clayton, Australia, <sup>3</sup>Monash Centre for Additive Manufacturing, Monash University, Melbourne, Australia, <sup>4</sup>Materials Engineering, Monash University, Clayton, Australia

#### 8:30 a.m.

**Mechanical and Electrochemical Evaluation of Ti-6Al-4V 3-D Printed Alloys Versus their Wrought Counterparts: Ms. Hannah Bindig**<sup>1</sup>, Dr. Paul M. Natishan<sup>2</sup> and Mr. Scott Olig<sup>2</sup>, <sup>1</sup>Vision Point Systems in support of the Naval Research Laboratory, Washington, DC, <sup>2</sup>6130, Naval Research Laboratory, Washington, DC

#### 9:00 a.m.

**Tensile Deformation and Fatigue Strength of DMLS Materials: Light Metals: Dr. Todd Mower** and Mr. Michael Long, MIT Lincoln Laboratory, Lexington, MA

#### 9:30 a.m.

Manipulation and Characterization of Novel Titanium Powder for Additive Manufacturing Applications: Alexandra Kingsbury, Mr. S. Gulizia<sup>1</sup>, Dr. Anselm Oh<sup>1</sup>, Ms. Yingying sun<sup>2</sup>, Prof. Ma Qian<sup>2</sup>, Dr. Y.F Yang<sup>2</sup> and Dr. Christian Doblin<sup>1</sup>, <sup>1</sup>Manufacturing Flagship, CSIRO, Melbourne, Australia, <sup>2</sup>RMIT, Melbourne, Australia

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

#### 10:30 a.m.

Selective Laser Melting (SLM) of Ti64 and Quality Control of its Products and Powder Feedstock: Prof. Xinhua Wu, Monash University, Notting Hill, Australia

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

Advanced Aluminum Alloys-Light High Performance Alloys and Structures II 8:00 a.m.-12:00 p.m. Meeting Room: 203A

> **Session Chair:** Mr. Michael Niedzinski Constellium South Barrington, IL USA

#### 8:00 a.m.

A New 2nd Generation AlMgSc Alloy for Aerospace Applications: Dr. Sabine Spangel, Dr. Achim Bürger and Philippe Meyer, Aleris Rolled Products Germany GmbH, Koblenz, Germany

#### 8:30 a.m.

Australian Scandium Supply – A Paradigm Shift for a Strategic Metal: Mr. Sam Riggall and Mr. John Carr, Clean TeQ Metals, Melbourne, Australia

#### 9:00 a.m.

Advanced Product Solutions for Commercial Aircraft Fuselage Structures: Mr. K. Paul Smith<sup>1</sup>, Dr. Frank Eberl<sup>1</sup>, Dr. J. Chevy<sup>2</sup>, M. Bouet-Griffon<sup>1</sup> and Ms. Gaëlle Pouget<sup>3</sup>, <sup>1</sup>Constellium LLC, Issoire Cedex, France, <sup>2</sup>Constellium R&D Center, Voreppe, France, <sup>3</sup>Constellium Research Center, Voreppe, France

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

#### 9:30 a.m.

Advanced Metallic Fuselage Alloy Development: Dr. Paul Magnusen<sup>1</sup>, Dr. David Heard<sup>1</sup> and Mr. Gregory Venema<sup>2</sup>, <sup>1</sup>Alcoa, Inc., Alcoa Center, PA, <sup>2</sup>Alcoa Inc, Riverdale, IA

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

#### 10:30 a.m.

Rapid Development of a New Kaiser High Strength Al-Li Sheet Alloy for Forming Applications: Mr. Roy

**Nash**<sup>1</sup>, Dr. Zhengdong (Steven) Long<sup>1</sup>, Dr. Florence Baldwin<sup>1</sup>, Mr. Philippe Lassince<sup>2</sup>, Mr. Jason Scheuring<sup>1</sup> and Mr. Rob Matuska<sup>3</sup>, <sup>1</sup>Research and Development, Kaiser Aluminum, Spokane, WA, <sup>2</sup>Research and Development, Kaiser Aluminum, Paris, France, <sup>3</sup>Research and Development, Kaiser Aluminum, Heath, OH

#### 11:00 a.m.

Recent Progress in Understanding the Durability and Damage Tolerance of AIRWARE Products: Dr. Nicolas Bayona, Dr. Timothy Warner, Ms. Gaëlle Pouget, Dr. Jean-Christophe Ehrstrom, Dr. C. Sigli, Dr. J. Chevy and Mr. Bernard Bes, Constellium Technology Center, Voreppe, France

#### 11:30 a.m.

Assessment of Aluminum Lithium Alloys for Primary Aircraft Structures: Mr. Kevin Stonaker<sup>1</sup>, John Bakuckas<sup>1</sup>, Ian Won<sup>2</sup>, Mark Freisthler<sup>2</sup>, Mr. Bruce Thomas<sup>3</sup> and Dr. Frank Eberl<sup>4</sup>, <sup>1</sup>FAA William J Hughes Technical Center, Atlantic City Int Airport, NJ, <sup>2</sup>FAA Transport Airplane Directorate, Renton, WA, <sup>3</sup>Bombardier Aerospace, Montreal, QC, Canada, <sup>4</sup>Constellium LLC, Issoire Cedex, France

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

Emerging Materials and Processes 8:00 a.m.–11:30 a.m. Meeting Room: 202A

#### **Session Chairs**:

Mr. John Lembo Boeing Research and Technology Seattle, WA USA

#### 8:00 a.m.

Recent Advances in High-Performance Nonflammable Magnesium Alloys for Wrought Applications: Dr. Young Min Kim, Dr. Sung Hyuk Park, Mr. Ha Sik Kim, Dr. Chang Dong Yim and Dr. Bong Sun You, Light Metals Division, Korea Institute of Materials Science, Changwon, South Korea

#### 8:30 a.m.

High-Strength and Flame-Resistant LPSO Magnesium Alloys Produced by Rapidly Solidified Powder Metallurgy Processing: Prof. Yoshihito Kawamura, Magnesium Research Center, Kumamoto University, Kumamoto, Japan

#### 9:00 a.m.

Hot Forming and Superplastic Forming: Presses Evolution and New Applications in the Aerospace Industry: Mr. Guillaume Sana, R&D, ACB, Nantes, France

#### 9:30 a.m.

Low-Cost Thin Titanium Shape Memory Alloy Foils by Planar Flow Casting: Mr. Michael Kellam, Dr. Guangsheng Song and Dr. Daniel Liang, CSIRO Manufacturing Flagship, Clayton, Australia

10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

#### 10:30 a.m.

**CFD Simulation Approach for Quenching and Thermal Treatment Optimization: Dr. David Greif**, AVL-AST d.o.o., Maribor, Slovenia

#### 11:00 a.m.

**Electric Discharge Machining of Low Conductivity Materials: Dr. Roberto Perez**, R & D, GF Machining Solutions, Geneva, Switzerland

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

Engineering, Protection and Repair of Aircraft Structural Parts 1 8:00 a.m.–11:30 a.m. Meeting Room: 102A

#### **Session Chairs**:

Mr. Thomas F. Lewis Praxair Surface Technologies Indianapolis, IN USA

> **Mr. Arash Gabchi** Boeing South Seattle, WA USA

#### 8:00 a.m.

**Cold Spraying for Aerospace Applications: Prof. Thomas Klassen**<sup>1</sup>, Dr. Kurt Binder<sup>1</sup>, Dr. María villa<sup>1</sup>, Dr. Frank Gärtner<sup>1</sup>, Prof. Hamid Assadi<sup>1</sup> and Dr. Thomas M. Gartner<sup>2</sup>, <sup>1</sup>Department of Mechanical Engineering, Helmut Schmidt University, University of the Federal Armed Forces Hamburg, Hamburg, Germany, <sup>2</sup>Lufthansa Technik AG, Hamburg, Germany

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

#### 8:40 a.m.

**Metallization of Polymeric Substrates by Cold Spray – Is it Possible?: Dr. Julio Villafuerte**<sup>1</sup>, Dr. Jianfeng Wang<sup>2</sup> and Dr. Harvey Ye<sup>2</sup>, <sup>1</sup>Corporate, Centerline (Windsor) Limited, Windsor, ON, Canada, <sup>2</sup>SST, Centerline (Windsor) Limited, Windsor, ON, Canada

#### 9:00 a.m.

**Spall Resistant HVOF Coatings: Mr. David Webb**, R&D, ES3, Clearfield, UT

#### 9:20 a.m.

**Mechanism of Calcareous Deposit formation on TSA-coated Steel Structures at Elevated Temperatures: Dr. Shiladitya Paul**<sup>1</sup>, Ms. N S Zulkfli<sup>2</sup>, Dr. K Yunus<sup>2</sup>, Dr. A C Fisher<sup>2</sup> and Mr. M D F Harvey<sup>3</sup>, <sup>1</sup>Materials Group, TWI, Cambridge, United Kingdom, <sup>2</sup>Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, United Kingdom, <sup>3</sup>Surface Engineering, TWI, Cambridge, United Kingdom

#### 9:40 a.m.

**Improving the Adhesion Of Wear-Resistant Coatings on Aerospace Polymer Composites: Ms. Axelle Elrikh<sup>1</sup>**, Dr. Simon Goutier<sup>1</sup>, Dr. Gordon Armstrong<sup>2</sup> and Prof. Armelle Vardelle<sup>1</sup>, <sup>1</sup>European Ceramic Center, University of Limoges, Limoges, France, <sup>2</sup>Materials and Surface Science Institute, University of Limerick, Limerick, Ireland

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

#### 10:30 a.m.

Coaxial Laser Assisted Cold Sprayed WC-Co Coatings: Microstructure and Mechanical Properties: Mr. Praneet Talwar, Mr. Vikram Varadaraajan and Prof. Pravansu Mohanty, Mechanical Engineering, UNIVERSITY OF MICHIGAN DBN, Dearborn, MI

#### 10:50 a.m.

**Process-Property Correlation of Heat Treated Aluminium 6061 Cold Spray Coatings: Mr. Kelvin Loke**, ST Kinetics Integrated Engineering Pte Ltd, Singapore, Singapore

#### 11:10 a.m.

Effect of Friction-stir Processing on the Wear Rate of WC-based MMC Coatings Deposited by Low Pressure Cold Gas Dynamic Spraying: Mr. Sayed Hossein Ashrafizadeh<sup>1</sup>, Mr. Adrian Lopera<sup>1</sup>, Dr. Adrian Gerlich<sup>2</sup> and Dr. André McDonald<sup>1</sup>, <sup>1</sup>Mechanical Engineering, University of Alberta, Edmonton, AB, Canada, <sup>2</sup>Mechanical and Mechatronics Engineering, University of Waterloo, Waterloo, ON, Canada

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

Non Destructive Evaluation Techniques in Aerospace 8:00 a.m.–12:00 p.m. Meeting Room: 202B

#### **Session Chair:**

**Dr. Richard Freeman** *TWI Ltd Cambridge, United Kingdom* 

#### 8:00 a.m.

In Process Inspection of Friction Stir Welds using Laser UT: Mr. Ian Cooper<sup>1</sup>, Dr. Richard Freeman<sup>2</sup>, Mr. Simon Garner<sup>1</sup>, Mr. Peter Lundin<sup>3</sup> and Mr. Patrik Broberg<sup>4</sup>, <sup>1</sup>VAL, TWI Technology Centre Wales, Port Talbot, United Kingdom, <sup>2</sup>TWI Ltd, Cambridge, United Kingdom, <sup>3</sup>Swerea KIMAB, Kista, Sweden, <sup>4</sup>University West, Trollhättan, Sweden

#### 8:30 a.m.

Quantitative Percussion Diagnostics For Evaluating Bond Integrity Between Composite Laminates: Mr. Scott Poveromo and Dr. James Earthman, Chemical Engineering and Materials Science, University of California, Irvine, Irvine, CA

#### 9:00 a.m.

Rapid Inspection of Composite and Additive Manufactured Components using Advanced Ultrasonic Techniques: Mr. Ian Cooper<sup>1</sup>, Mr. Carmelo Mineo<sup>2</sup>, Dr. Ben Wright<sup>1</sup>, Dr. Richard Freeman<sup>3</sup>, Dr. Ian Nicholson<sup>1</sup> and Dr. Dimos Liaptsis<sup>1</sup>, <sup>1</sup>VAL, TWI Technology Centre Wales, Port Talbot, United Kingdom, <sup>2</sup>CUE, University of Strathclyde, Glasgow, United Kingdom, <sup>3</sup>TWI Ltd, Cambridge, United Kingdom

#### 9:30 a.m.

Laminated Test Specimen for Thin Metallic Materials—A Novel Approach to Determine Compression Strength: Mr. Steven Fantle<sup>1</sup>, Mr. Guillaume Delgrange<sup>2</sup>, Mr. Edmund Dunn<sup>3</sup> and Mr. K. Paul Smith<sup>4</sup>, <sup>1</sup>Boeing Company, Seattle, WA, <sup>2</sup>Constellium Technology Center, Voreppe, France, <sup>3</sup>Constellium Aerospace and Transportation, Kirkland, WA, <sup>4</sup>Constellium Aerospace and Transportation, Ravenswood, WV

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

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# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

#### 10:00 a.m.

**Nondestructive Determination of Bulk Residual Stresses: Dr. T. Calvin Tszeng**, Santa Clara University, Santa Clara, CA

#### 11:00 a.m.

**Non-Destructive Testing of Components Made by Selective Laser Melting: Dr. Paul Rometsch**<sup>1,2</sup>, Dr. Daniele Pelliccia<sup>3</sup>, Dr. Ulf Garbe<sup>4</sup>, Dr. Dacian Tomus<sup>1,2</sup>, Dr. Stephanie Giet<sup>1,2</sup> and Prof. Xinhua Wu<sup>1,2</sup>, <sup>1</sup>Monash Centre for Additive Manufacturing, Monash University, Melbourne, Australia, <sup>2</sup>Department of Materials Engineering, Monash University, Melbourne, Australia, <sup>3</sup>School of Physics, Monash University, Melbourne, Australia, <sup>4</sup>Bragg Institute, Australian Nuclear Science and Technology Organisation, Sydney, Australia

#### 11:30 a.m.

**Detecting Contact-Type Cracks by Modulation Spectroscopy of Acoustic Waves: Dr. T. Calvin Tszeng**, Santa Clara University, Santa Clara, CA

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

Titanium Alloy Technology I 8:00 a.m.–11:30 a.m. Meeting Room: 201B

#### **Session Chairs:**

**Dr. Daniel G. Sanders** *The Boeing Company Seattle, WA USA* 

Mr. Robert Briggs The Boeing Company Seattle, WA USA

#### 8:00 a.m.

**Titanium Development Needs for the Airframe Industry: A 2015 Update: Dr. James D. Cotton**, Materials and Manufacturing Technology, Boeing Research and Technology, Seattle, WA

#### 8:30 a.m.

**Deformation Studies of Titanium Wire for Fastening Systems Performance: Dr. John Foltz**, ATI, Albany, OR

#### 9:00 a.m.

Mechanical Properties and Microstructures of Low-Cost, Friction Stir welded Ti-531C Plates for Aircraft Applications: Prof. Mitsuo Niinomi<sup>1</sup>, Dr. Masaaki Nakai<sup>1</sup>, Dr. Ken Cho<sup>1</sup>, Dr. Kengo Narita<sup>1</sup>, Prof. Hidetoshi Fujii<sup>2</sup>, Dr. Yoshiaki Morisada<sup>2</sup>, Mr. Yoshinori Ito<sup>3</sup>, Mr. Takashi Konno<sup>4</sup>, Mr. Yoshio Itsumi<sup>5</sup>, Dr. Hideo Oyama<sup>6</sup>, Mr. Wataru Abe<sup>7</sup>, Mr. Koji Asai<sup>7</sup> and Dr. Kenichi Kamimuki7, 1Institute for Materials Research, Tohoku University, Sendai, Japan, <sup>2</sup>Joining and Welding Research Institute, Osaka University, Ibaraki, Japan, <sup>3</sup>Kobe Steel, Ltd., Materials Reserach Laboratory, Kobe, Japan, <sup>4</sup>Titanium Research and Development section, Titanium Division, Iron & Steel Business, Kobe Steel, Ltd., Takasago, Japan, ⁵Titanium Research Laboratory, Kobe Steel, Ltd., Takasago, Japan, <sup>6</sup>Titanium Research and Development Section, Titanium Division, Iron & Steel Business, Kobe Steel, Ltd., Takasago, Japan, <sup>7</sup>Aerospace Company, Kawasaki Heavy Industries, Ltd., Kagamigahara, Japan

#### 9:30 a.m.

Beta-C Titanium Alloy Revisited: Dr. Sesh Tamirisa, RTI International Metals Inc, Niles, OH

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

#### 10:30 a.m.

**Sheet Roll Forming of a New High-Strength Titanium Alloy: Dr. Luis Ruiz-Aparicio**<sup>1</sup> and Mr. Holger Kerstan<sup>2</sup>, <sup>1</sup>Market & Prod. Devl., ATI, Natrona Heights, PA, <sup>2</sup>Welser Profile Austria GmbH, Ybbsitz, Austria

#### 11:00 a.m.

**Conditions of Invar-Type Effect Origin in Martensitic Titanium Alloy:** Prof. Sergey Demakov, **Dr. Stepan Stepanov** and Prof. Anatoly Illarionov, Heat Treatment and Physics of Metals, Ural Federal University named after the First President of Russia B.N. Yeltsin, Yekaterinburg, Russia

12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

#### Welding and Joining III 8:00 a.m.–11:30 a.m. Meeting Room: 202C

#### **Session Chair:**

Mr. Gary Coleman Boeing Research & Technology Seattle, WA USA

#### 8:00 a.m.

In Situ Characterisation of the Strain Distribution Produced Around GTAW Welds: Dr. H J Stone<sup>1</sup>, Dr. Nicholas G. Jones<sup>2</sup>, Dr. Sebastien Rouquette<sup>1</sup>, Dr. Joe Kelleher<sup>3</sup>, Dr. David Dye<sup>4</sup> and Dr. Leigh Connor<sup>5</sup>, <sup>1</sup>Department of Materials Science & Metallurgy, University of Cambridge, Cambridge, United Kingdom, <sup>2</sup>The University of Cambridge, Cambridge, United Kingdom, <sup>3</sup>ISIS pulsed neutron and muon source, Didcot, United Kingdom, <sup>4</sup>Imperial College London, London, United Kingdom, <sup>5</sup>Diamond Light Source Ltd, Didcot, United Kingdom

#### 8:30 a.m.

Single-Sided Laser Beam Welding of Dissimilar T-Joints for the Aircraft Industry: Ms. Josephin Enz, Stefan Riekehr, Volker Ventzke and Nikolai Kashaev, Joining and Assessment (WMF), Helmholtz-Zentrum Geesthacht—Centre for Materials and Coastal Research, Geesthacht, Germany

#### 9:00 a.m.

Laser Welding of Stainless Steel Weldments Applied in Aeronautical: Ms. María del Carmen Ramírez López<sup>1</sup>, Dr. Francisco Fernando Curiel López<sup>1</sup>, Dr. José Ángel Cabral Miramontes<sup>1</sup>, Dr. Citlalli Gaona Tiburcio<sup>1</sup>, Dr. Patricia Zambrano<sup>2</sup> and Dr. Facundo Almeraya Calderón<sup>1</sup>, <sup>1</sup>Corrosión, Centro de Investigación e Innovación en ingeniería Aeronáutica-FIME-UANL, Apodaca, Mexico, <sup>2</sup>Facultad de Ingeniería Mecánica y Eléctrica, Universidad Autónoma de Nuevo León, San Nicolas de los Garza, Mexico

#### 9:30 a.m.

**Pi Box Weld Development:** Mr. Gary Coleman<sup>1</sup> and **Ms. Bridgette Hannifin**<sup>2</sup>, <sup>1</sup>Metallics—Welding and Forming, Boeing Research & Technology, Seattle, WA, <sup>2</sup>787 Program Support, Boeing Research & Technology, Seattle, WA

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

#### 10:30 a.m.

Microstructural and Mechanics Caracterization of Stainless Steel Weldments Applied in Vanes of Missiles: Ms. María del Carmen Ramírez López<sup>1</sup>, Dr. Francisco Fernando Curiel López<sup>1</sup>, Dr. Mario Alberto Garcia Ramirez<sup>2</sup>, Dr. Citlalli Gaona Tiburcio<sup>1</sup>, Dr. Patricia Zambrano<sup>3</sup> and Dr. Facundo Almeraya Calderón<sup>1</sup>, <sup>1</sup>Corrosión, Centro de Investigación e Innovación en ingeniería Aeronáutica-FIME-UANL, Apodaca, Mexico, <sup>2</sup>Centro de Investigación e Innovación en ingeniería Aeronáutica-FIME-UANL, Apodaca, Mexico, <sup>3</sup>Facultad de Ingeniería Mecánica y Eléctrica, Universidad Autónoma de Nuevo León, San Nicolas de los Garza, Mexico

#### 11:00 a.m.

Investigation of Alloy 2050 FSWelding: Dr. Michael Eller<sup>1</sup>, Matthew Champagne<sup>2</sup> and Matthew Melerine<sup>2</sup>, <sup>1</sup>Lockheed Martin, New Orleans, LA, <sup>2</sup>University of New Orleans, New Orleans, LA

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

#### Tuesday Plenary Session 1:00 p.m.–3:30 p.m. Exhibit Halls A&B

#### 1:00 p.m.

AeroMat Plenary Presentation, Mr. Humberto Luiz de Rodrigues Pereira, Embraer, presenting on Advanced Structural Materials

#### **1:45 p.m.** ITSC/TSS Award Presentations

TSC/TSS Award Presentation

#### 2:00 p.m.

**ITSC Plenary Presentation** 

#### 2:45 p.m.

**IMS Plenary Presentation** 

3:30 p.m.-4:00 p.m. • Refreshment Break • Exhibit Halls A&B •

#### Additive Manufacturing III 4:00 p.m.–5:30 p.m. Meeting Room: 201A

#### **Session Chair**:

Ms. Devon Beckett NAVAIR FRC East Cherry Point, NC USA

#### 4:00 p.m.

**Evaluation of Multiple Heat Treat Schedules on Mechanical Properties of Additively Manufactured Nickel Alloy 718: Mr. Hank Phelps**, Lockheed-Martin, Marietta, GA

#### 4:30 p.m.

Selective Laser Melting (SLM) of a Ni Alloy and its Components: Prof. Xinhua Wu, Monash University, Notting Hill, Australia 31

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

#### 5:00 p.m.

Development of the Additive Manufacturing Process for the ATI C-103<sup>™</sup> Niobium Alloy: Dr. Noah Philips, Allegheny Technologies, Albany, OR

7:00 p.m.-10:00 p.m. • Social Event\*• Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike• \*Ticket Required & Sold Separately

Engineering, Protection and Repair of Aircraft Structural Parts 2 4:00 p.m.–5:40 p.m. Meeting Room: 102A

#### **Session Chairs:**

Dr. Li Li Praxair Surface Technologies, Inc. Indianapolis, IN USA

> Mr. Christopher Dambra Oerlikon Corporation Export, PA USA

#### 4:00 p.m.

The Effect of Complex Geometrical Variations within the Spray Footprint on Thermal Barrier Coating Properties: Mr. Mitchell L. Sesso<sup>1</sup>, Prof. Christopher C. Berndt<sup>1</sup>, Dr. John Thornton<sup>2</sup> and Ms. Sun Yung Kim<sup>1</sup>, <sup>1</sup>Industrial Research Institute Swinburne (IRIS), Swinburne University of Technology, Hawthorn, VIC, Australia, <sup>2</sup>Air Vehicles Division, DSTO, Melbourne, Australia

#### 4:20 p.m.

Advanced Cold Spray Development for Aerospace Aluminum Alloys: Mr. Victor K. Champagne, U.S. Army Research Laboratory, Aberdeen Proving Ground, MD

#### 4:40 p.m.

**Evaluation of Powder Properties on the Perfor**mance of Cold Sprayed Ti6Al4V for Aerospace Repairs: Dr. Tiziana Marrocco<sup>1</sup>, Philip McNutt<sup>1</sup>, Dr. Roger Barnett<sup>1</sup>, Dr. Simone Vezzù<sup>2</sup>, Enrico Vedelago<sup>3</sup>, Prof. Mario Guagliano<sup>4</sup>, Dr. Seyyed Mostafa Hassani-Gangaraj<sup>5</sup>, Dr. Pedro Poza<sup>6</sup>, Dr. C.J. Munez<sup>7</sup>, Miguel Angel Garrido-Maneiro<sup>6</sup>, A. Rico<sup>6</sup>, Robert Deffley<sup>8</sup>, Antonio Aragon-Ortiz<sup>9</sup> and Ms. H L de Villiers Lovelock<sup>1</sup>, <sup>1</sup>TWI ltd, Cambridge, United Kingdom, <sup>2</sup>Dipartimento di Ingegneria Meccanica, Politecnico di Milano, Milano, Italy, <sup>3</sup>Veneto Nanotech, Venezia, Marghera, Italy, <sup>4</sup>Mechanical engineering department, Politecnico di Milano, Milano, Italy, <sup>5</sup>Mechanical Engineering Department, Politecnico di Milano, Milano, Italy, <sup>6</sup>Univeridad Rey Juan Carlos, Mostoles, Spain, <sup>7</sup>Veneto Nanotech, Venice, Italy, <sup>8</sup>LPW Technology, Runcorn, United Kingdom, <sup>9</sup>Ingenieria de SPF, Airbus Military (CBC Plant), El Puerto de Santa Maria (Cadiz), Spain

#### 5:00 p.m.

**Cold Spray of Al Alloys as Repair Technology in Aeronautics:** Dr. Simone Vezzù<sup>1</sup>, Enrico Vedelago<sup>1</sup>, Mr. Peter Richter Sr<sup>2</sup>, Mr. Peter Richter Jr<sup>2</sup>, Prof. Mario Guagliano<sup>3</sup>, Mrs. Atieh Moridi<sup>3</sup>, Dr. Pedro Poza<sup>4</sup>, Dr. C.J. Munez<sup>4</sup>, Dr. Giovanni Paolo Zanon<sup>5</sup> and Dr. Giovanni Alfeo<sup>6</sup>, **Dr. Seyyed Mostafa Hassani Gangaraj**<sup>7</sup> <sup>1</sup>Veneto Nanotech, Venice, Italy, <sup>2</sup>Impact Innovations GmbH, Rattenkirchen, Germany, <sup>3</sup>Mechanical engineering department, Politecnico di Milano, Milano, Italy, <sup>4</sup>Univeridad Rey Juan Carlos, Mostoles, Spain, <sup>5</sup>GE Avio s.r.l., Rivalta di Torino, Italy, <sup>6</sup>GE Avio s.r.l., Brindisi, Italy, <sup>7</sup>Mechanical Engineering Department, Politecnico di Milano, Milano, Italy

#### 5:20 p.m.

The Measurement of Residual Stresses in Cold Sprayed Nickel Based Superalloys via Neutron Diffraction: Ms. Sun Yung Kim<sup>1</sup>, Dr. Vladimir Luzin<sup>2</sup>, Dr. John Thornton<sup>3</sup>, Dr. Peter King<sup>4</sup>, Dr. Darren Fraser<sup>4</sup>, Mr. Mitchell L. Sesso<sup>1</sup>, Mr. Stefan Gulizia<sup>4</sup>, Dr. Yat Choy Wong<sup>1</sup> and **Prof. Christopher C. Berndt<sup>1</sup>**, <sup>1</sup>Industrial Research Institute Swinburne (IRIS), Swinburne University of Technology, Hawthorn, VIC, Australia, <sup>2</sup>The Bragg Institute, Australian Nuclear Science and Technology Organisation, Sydney, Australia, <sup>3</sup>Air Vehicles Division, DSTO, Melbourne, Australia, <sup>4</sup>Manufacturing Flagship, CSIRO, Melbourne, Australia

7:00 p.m.-10:00 p.m. • Social Event\*• Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike• \*Ticket Required & Sold Separately

Recent Developments in Ferrous Alloys 4:00 p.m.–5:30 p.m. Meeting Room: 202A

#### **Session Chairs:**

**Mr. Brian Boyette** NAVAIR Cherry Point, NC USA

**Dr. Michael Hahn** Northrop Grumman Corporation Torrance, CA USA

Dr. Jeffrey Waldman Navmar Applied Sciences Corporation Warmister, PA USA

#### 4:00 p.m.

High-Strength Stainless Steels: A Balance to Achieve Mechanical Properties and Stress Corrosion Resistance: Mr. Martin Surand<sup>1</sup>, Mr. Franck Devilder<sup>2</sup>, Mr. Jacques Lecadet<sup>3</sup>, Mr. Sylvain Puech<sup>3</sup>, Dr. Nicolas Binot<sup>4</sup> and Mrs. Valentine Deneux<sup>4</sup>, <sup>1</sup>Material & Process Department, Messier Bugatty Downty, Bidos, France, <sup>2</sup>Technical direction, Aubert&Duval, PARIS CEDEX 15, France, <sup>3</sup>Technical direction, Aubert&Duval, Les Ancizes, France, <sup>4</sup>Material & Process department, Messier Bugatty Downty, Bidos, France

#### 4:30 p.m.

**Properties of M54 Steel: Dr. Eun U. Lee**, Navy, Naval Air Warfare Center Aircraft Division, Patuxent River, MD

#### 5:00 p.m.

Integrated Computational Materials Engineering (ICME) Development of a High-Hardness Solution-Nitrided Stainless Steel: Dr. Jason Sebastian, Jiadong gong, Mr. David Snyder, Nicholas Hatcher and Prof. Gregory Olson, QuesTek Innovations, LLC, Evanston, IL

7:00 p.m.-10:00 p.m. • Social Event \*• Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike• \*Ticket Required and Sold Separatly

# Wednesday, May 13, 2015

Additive Manufacturing IV 8:00 a.m.–12:00 p.m. Meeting Room: 201A

#### Session Chair:

**Dr. Daniel G. Sanders** *The Boeing Company Seattle, WA USA* 

#### 8:00 a.m.

Laser Metal Deposition of an Al-0.9wt%Sc Alloy: Dr. Paul Rometsch<sup>1,2</sup>, Dr. Tom Jarvis<sup>1,2</sup> and Prof. Xinhua Wu<sup>1,2</sup>, <sup>1</sup>Monash Centre for Additive Manufacturing, Monash University, Melbourne, Australia, <sup>2</sup>Department of Materials Engineering, Monash University, Melbourne, Australia

#### 8:30 a.m.

**The Influence of Processing Parameters on Selective Laser Melting of A357 Al Cast Alloy: Mr. Heng Rao**<sup>1,2</sup>, Dr. Stephanie Giet<sup>2,3</sup>, Prof. Chris Davies<sup>1,2</sup> and Prof. Xinhua Wu<sup>2,3</sup>, <sup>1</sup>Mechanical and Aerospace Engineering, Monash University, Clayton, Australia, <sup>2</sup>Monash Centre for Additive Manufacturing, Notting Hill, Australia, <sup>3</sup>Materials Engineering, Monash University, Clayton, Australia

#### 9:00 a.m.

Selective Reinforcement Using Metal Matrix Composite Prepreg and Ultrasonic Additive Manufacturing: Mr. Brian Gordon<sup>1</sup> and Mr. Mark Norfolk<sup>2</sup>, <sup>1</sup>Touchstone Research Laboratory, Triadelphia, WV, <sup>2</sup>Fabrisonic, Columbus, OH

#### 9:30 a.m.

**Industrial Applications of Laser Additive Manufacture:** Dr. Richard Freeman<sup>1</sup>, **Dr. Robert Scudamore**<sup>2</sup>, Dr. Carl Hauser<sup>2</sup> and Dr. Sozon Tsopanos<sup>2</sup>, <sup>1</sup>TWI Ltd, Cambridge, United Kingdom, <sup>2</sup>TWI Technology Centre (Yorkshire), Rotherham, United Kingdom

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

#### 10:30 a.m.

**Quality Assurance for Electron Beam 3D Printing:** Dr. Richard Freeman<sup>1</sup>, Mr. Mike Nunn<sup>2</sup>, Dr. Colin Ribton<sup>2</sup> and **Dr. Robert Scudamore**<sup>3</sup>, <sup>1</sup>TWI Ltd, Cambridge, United Kingdom, <sup>2</sup>Electron Beam, TWI Limited, Cambridge, United Kingdom, <sup>3</sup>TWI Technology Centre (Yorkshire), Rotherham, United Kingdom

#### 11:00 a.m.

Additively Manufactured Vents for NASA's Orion Exploration Flight Test 1: Mr. Andrew Clifton<sup>1</sup>, Mr. Roger Taylor III<sup>2</sup>, Mr. Brian Tichenor<sup>3</sup> and Mr. Alex Fima<sup>4</sup>, <sup>1</sup>Lockheed Martin Space Systems Company, New Orleans, LA, <sup>2</sup>Lockheed Martin Space Systems Company, Kennedy Space Center, FL, <sup>3</sup>Lockheed Martin Information Systems & Global Solutions, Houston, TX, <sup>4</sup>RTI Directed Manufacturing, Austin, TX

#### 11:30 a.m.

On Influence of Processing Parameters on Surface Roughness and Microstructure of Hastelloy X Produced by Selective Laser Melting (SLM): Mr. Yang Tian<sup>1</sup>, Prof. Xinhua Wu<sup>2</sup>, Dr. Dacian Tomus<sup>1</sup>, Dr. Emilie Herny<sup>3</sup>, Dr. Jean-Francois Rideau<sup>3</sup> and Dr. Stephane Vaillant<sup>3</sup>, <sup>1</sup>Monash Centre for Additive Manufacturing, Monash University, Victoria, Australia, <sup>2</sup>Monash University, Notting Hill, Australia, <sup>3</sup>Microturbo, Toulouse, France

• Lunch On Own •

#### Bond Coat Development forTBCs 8:00 a.m.–9:40 a.m. Meeting Room: 102B

**Session Chairs:** Prof. Robert Vaßen Forschungszentrum Jülich GmbH Jülich, Germany

> Mr. Raymond Sinatra Rolls Royce Coporation Indianapolis, IN USA

#### 8:00 a.m.

**Plasma Sprayed High Entropy Alloys: Microstructure and Properties of AlCoCrFeNi and MnCoCrFe Ni: Dr. Andrew S.M. Ang**<sup>1</sup>, Prof. Christopher C. Berndt<sup>2</sup>, Mr. Mitchell L. Sesso<sup>2</sup>, Ms. Ameey Anupam<sup>3</sup>, Mr. 33

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

Praveen Sathiyamoorthi<sup>3</sup>, Dr. Ravi Sankar Kottada<sup>3</sup> and Prof. B.S. Murty<sup>3</sup>, <sup>1</sup>Industrial Research Institute Swinburne (IRIS), Swinburne University of Technology, Hawthorn, VIC, Australia, <sup>2</sup>Industrial Research Institute of Swinburne (IRIS), Swinburne University of Technology, Melbourne, Australia, <sup>3</sup>Department of Metallurgical and Materials Engineering, Indian Institute of Technology Madras, Chennai, India

#### 8:20 a.m.

Investigation of Cold Sprayed MCrAlY as a Bondcoat Candidate for Thermal Barrier Coating: Dr. Xinqing Ma<sup>1</sup> and Mr. Peter Ruggiero<sup>2</sup>, <sup>1</sup>Curtis Wright Corporation, East Windsor, CT, <sup>2</sup>Curtiss Wright Corporation, East Windsor, CT

#### 8:40 a.m.

Low Pressure Coating System (LPCS) for Plasma Spraying of Aerospace Gas Turbine Engine Applications: Dr. Robert Gansert<sup>1</sup>, Mr. Ralph Herber<sup>2</sup>, Mr. Adrian Vogel<sup>2</sup> and Mr. Ludwig Guggenheim<sup>2</sup>, <sup>1</sup>Advanced Materials & Technology Services, Inc., Simi Valley, CA, <sup>2</sup>AMT AG, Dottingen, Switzerland

#### 9:00 a.m.

Influence of Pre-treatment on the Growth Behavior of TGO on MCrAlY Bond Coat Surface: Mr. Bang-Yan Zhang, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

#### 9:20 a.m.

**Cold Sprayed CoNiCrAlY Bond Coats for Thermal Barrier Coatings Applications: Dr. Cristian V. Cojocaru** and Dr. Eric Irissou, National Research Council of Canada, Boucherville, QC, Canada

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

Engineering, Protection and Repair of Aircraft Structural Parts 3 8:00 a.m.–10:00 a.m. Meeting Room: 102A

#### **Session Chairs:**

**Mr. Alan W. Burgess** SprayWerx Technologies Inc. North Vancouver, BC Canada

Mr. Lucian M. Gurban Tecnickrome Aeronautique Montreal, QC Canada

#### 8:00 a.m.

Additive Manufacturing using Kinetic Metallization<sup>™</sup>: Dr. Ralph Tapphorn, Mr. Howard Gabel and Mr. Kyle Burriesci, Inovati, Santa Barbara, CA

#### 8:20 a.m.

Hierarchical Nanocomposite Coatings for Component Life Extension: Mr. Andrew J. Sherman, Dr. Evelina Vogli and Mr. gabriel Santillan, Mesocoat Inc., Euclid, OH

#### 8:40 a.m.

Manufacturing of Thick, Crack-Free Wear Protective Coatings on Complex Geometries for Gas Turbine Parts: Dr. Thomas Duda and Mr. Marcus Riedel, Alstom (Switzerland), Birr, Switzerland

#### 9:00 a.m.

The Effect of Heat Treatment on Mechanical Properties of Thermally Sprayed Sandwich Structure Beams: Mr. Saeid Salavati, Prof. Thomas W. Coyle and Prof. Javad Mostaghimi, Centre for Advanced Coating Technologies (CACT), University of Toronto, Toronto, ON, Canada

#### 9:20 a.m.

Investigation of the Deposition Mechanism of Cold Spray onto Carbon Fibre Reinforced Polymers: Mr. Hanqing Che<sup>1</sup>, Prof. Stephen Yue<sup>2</sup> and Dr. Phuong Vo<sup>3</sup>, <sup>1</sup>Materials Engineering, McGill University, Montreal, QC, Canada, <sup>2</sup>Mining and Materials Engineering, McGill University, Montreal, QC, Canada, <sup>3</sup>National Research Council Canada, Boucherville, QC, Canada

#### 9:40 a.m.

The Phase Structure of High Purity Rare Earth Oxide Coatings Used for Anti-Plasma Erosion: Ms. Xiaojuan Ji, Mr. Yueguang Yu, Wei'ao Hou and Xianjing Ren, Beijing General Research Institute of Mingning & Metellurgy (BGRIMM), Beijing, China

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

High Temperature and Turbine Materials III 8:00 a.m.–11:30 a.m. Meeting Room: 202B

#### **Session Chair:**

Mr. Eli Ross UTC Pratt & Whitney East Hartford, CT USA

#### 8:00 a.m.

Influence of Shrinkage on the Mechanical Properties of Cast M247LC: Dr. Iñaki Madariaga, Nerea Villar and Isabel Quevedo, Materials & Processes, ITP, Zamudio, Spain

8:30 a.m.

**Cyclic Oxidation and Degradation of High-Temperature Alloys: Dr. Kuiying Chen**<sup>1</sup> and Dr. Prakash
Patnaik<sup>2</sup>, <sup>1</sup>Structures, Materials and Manufacturing Laboratory, National Research Council Canada, Ottawa, ON, Canada, <sup>2</sup>Gas Turbine Laboratory, National Research Council Canada, Ottawa, ON, Canada

### 9:00 a.m.

**Oxidation Kinetic of Nickel Base Superalloy for Seamless Wrought Rings in Aviation Industry:** Mr. Jorge Taboada<sup>1</sup>, Dr. Facundo Almeraya<sup>2</sup>, Prof. Patricia Zambrano<sup>3</sup>, Dr. Citllalli Gaona<sup>2</sup>, Dr. Alberto Villafañe<sup>4</sup> and **Mr. Manuel Lira**<sup>5</sup>, <sup>1</sup>Aeronautical Materials, Universidad Autonoma de Nuevo Leon, Apodaca, Mexico, <sup>2</sup>Aeronautical Materials, Universidad Autonoma de Nuevo Leon, Apocada, Nuevo León, Mexico, <sup>3</sup>AERONAUTICAL ENGINEERING, UNIVERSI-DAD AUTONOMA DE NUEVO LEON, SAN NICOLAS NL, Mexico, <sup>4</sup>Metallurgy, CIMAV, Chihuahua, Mexico, <sup>5</sup>Universidad Autonoma de Nuevo Leon, San Nicolas de los Garza, Mexico

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

### 10:30 a.m.

Rapid, Cost-Effective, Melt Infiltration Processing of Ultrahigh Temperature Ceramic and Metal Matrix Composites: Dr. Jacob J. Stiglich, Mr. Jerry Brockmeyer, Mr. Timothy Stewart and Mr. Brian Williams, Ultramet, Pacoima, CA

### 11:00 a.m.

**Predicting the Self-Healing Potential of MAX Phase Metallo-Ceramics under Turbine Engine Relevant Conditions: Ms. Ann-Sophie Farle**, TU Delft, Delft, Netherlands

Lunch On Our

• Lunch On Own •

Surface Engineering and Fatigue Life Enhancement 8:00 a.m.–11:30 a.m. Meeting Room: 202C

### **Session Chair:**

**Peter Bittner** Constellium Hoffman Estates, IL, USA

### 8:00 a.m.

On the Application of Cold Spray Coating in Repairing Damaged Parts: Study of Cavity Filling and Fatigue Behavior: Dr. Simone Vezzù<sup>1</sup>, Mrs. Atieh Moridi<sup>2</sup>, Prof. Mario Guagliano<sup>3</sup> and Dr. Seyyed Mostafa Hassani Gangaraj<sup>2</sup>, <sup>1</sup>Veneto Nanotech, Venezia, Marghera, Italy, <sup>2</sup>Mechanical Engineering Department, Politecnico di Milano, Milano, Italy, <sup>3</sup>Mechanical engineering department, Politecnico di Milano, Milano, Italy

### 8:30 a.m.

**Nitriding Hardness Validation: Mr. William Wentland**, Materials Science & Engineering, United Technologies Aerospace Sytems, Rockford, IL

### 9:00 a.m.

**Metallic Glass Coating for Enhancing Fatigue Property:** Mr. C. H. Chang<sup>1</sup>, Dr. C. M. Lee<sup>1</sup>, Mr. Chia-Chi Yu<sup>1</sup>, Dr. Wahyu Diyatmika<sup>1</sup>, Prof. Peter K. Liaw<sup>2</sup> and **Prof. Jinn P. Chu**<sup>1</sup>, <sup>1</sup>Dept. of Materials Sci. and Eng., National Taiwan University of Science and Technology, Taipei, Taiwan, <sup>2</sup>Department of Materials Science and Engineering, The University of Tennessee, Knoxville, TN

### 9:30 a.m.

Fretting Wear, Rotary Bending and Ultrasonic Fatigue Properties of Aged Inconel 718 Alloy Subjected to Ultrasonic Nanocrystal Surface Modification Technique: Dr. Auezhan Amanov<sup>1</sup>, Mr. Jun-Hyong Kim<sup>1</sup>, Dr. In-sik Cho<sup>2</sup> and Prof. Young-Sik Pyun<sup>1</sup>, <sup>1</sup>Mechanical Engineering, Sun Moon University, Asan, South Korea, <sup>2</sup>Mbrosia, Asan-si, South Korea

10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

### 10:30 a.m.

Improvement in Rotary Bending Fatigue and Ultrasonic Fatigue Behavior of Ti-6Al-4V STA alloy by Ultrasonic Nanocrystal Surface Modification Technique: Prof. Young-Sik Pyun<sup>1</sup>, Dr. Auezhan Amanov<sup>1</sup>, Mr. Jun-Hyong Kim<sup>1</sup> and Dr. In-sik Cho<sup>2</sup>, <sup>1</sup>Mechanical Engineering, Sun Moon University, Asan, South Korea, <sup>2</sup>Mbrosia, Asan-si, South Korea

### 11:00 a.m.

Ultrasonic Nanocrystalline Surface Modification (UNSM) Technique towards Improving Mechanical and Tribological Properties of Metallic Materials ald Ceramics: Mr. Jun-Hyong Kim, Dr. Auezhan Amanov and Prof. Young-Sik Pyun, Mechanical Engineering, Sun Moon University, Asan, South Korea

• Lunch On Own •

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

### Sustainability of Aerospace Materials & Processes 8:00 a.m.-10:00 a.m. Meeting Room: Room 201B

Session Chairs: Mr. Fernando Fernandez Embraer São José dos Campos, Brazil

**Dr. James D. Cotton** Boeing Research and Technology Seattle, WA USA

### 8:00 a.m.

A Preliminary Study on Glass Fiber Reinforced Thermoplastic Composite Fabrication for Small Wind Turbine Blade: Dr. Dave Kim, Mr. Juan Garate, Dr. Steve Solovitz and Mr. Sina Alizadeh Ashrafi, Washington State University Vancouver, Vancouver, WA

### 8:30 a.m.

Ultra-Low NOx Technology with Temperature Uniformity Benefits for Forge and Heat Treat Applications: Mr. Justin Dzik<sup>1</sup> and Mr. William Tracey<sup>2</sup>, <sup>1</sup>Research and Development, Fives North American Combustion, Cleveland, OH, <sup>2</sup>Specialty Sales Group, Fives North American Combustion, Cleveland, OH

### 9:00 a.m.

**CO2 Technology Transforms Manufacturing: Mr. David Jackson**, CleanLogix LLC, Santa Clarita, CA

### 9:30 a.m.

A New Design for Aircraft Weight Distribution Control: Dr. Mohsine Bouya<sup>1</sup>, Dr. Badr Abou El majd<sup>2</sup> and Prof. Abdellatif Ben Abdellah<sup>3</sup>, <sup>1</sup>R&D, Université Internationale de Rabat, Sala al Jadida, Morocco, <sup>2</sup>Math & CS, Université Hassan II, Casablanca, Morocco, <sup>3</sup>Université Abdelmalek Essaidi, Tanger, Morocco

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

Advanced Aluminum Alloys- Light High Performance Alloys and Structures III 8:30 a.m.–11:30 a.m. Meeting Room: 203A

### **Session Chair:**

**Dr. Julien Boselli** Alcoa Technical Center Alcoa Center, PA USA

### 8:30 a.m.

**Properties of High Energy Milled Structural Aluminum MMC:** Mr. Don Hashiguchi, FASM<sup>1</sup>, **Dr. David Tricker**<sup>2</sup> and Mr. Andrew Tarrant<sup>2</sup>, <sup>1</sup>Materion Beryllium & Composites, Elmore, OH, <sup>2</sup>Materion Aerospace Metal Composites Ltd, Farnborough, Hampshire, England

### 9:00 a.m.

**Progression of Corrosion Damage in a 3rd Generation Aluminum Lithium Alloy 2060: Mr. Michael Velez**<sup>1</sup>, Dr. Nick Wilson<sup>2</sup>, Mr. Homero Castaneda<sup>3</sup> and Dr. Kumar Jata<sup>4</sup>, <sup>1</sup>UES Inc.AFRL/RXCM, Wright-Patterson AFB, OH, <sup>2</sup>UDRI, AFRL/RXSS, Wright-Patterson AFB, OH, <sup>3</sup>University of Akron, Akron, OH, <sup>4</sup>Materials & Manufacturing Directorate, AFRL/RXCM, Wright-Patterson AFB, OH

### 9:30 a.m.

**The Aluminum Association Wrought Alloy and Temper Designation System: Mr. John Weritz**<sup>1</sup> and Mr. Michael Niedzinski<sup>2</sup>, <sup>1</sup>The Aluminum Associaiton, Arlington, VA, <sup>2</sup>Constellium, South Barrington, IL

10:00 a.m.-10:30 a.m. • Refreshment Break • Exhibit Halls A&B •

### 10:30 a.m.

A20X, Already in Serial Casting Production, also Shows Remarkable Properties in Powder Metallurgy, Extrusion, Sheet and Superplastic Forming: Mr. Mike Bond, Aeromet International PLC, Worcester, United Kingdom

### 11:00 a.m.

Advanced Aluminum Materials for Elevated Temperature Applications: Mr. Edmund Dunn<sup>1</sup>, Dr. Timothy Warner<sup>2</sup>, Dr. C. Sigli<sup>1</sup>, Ms. Gaëlle Pouget<sup>3</sup> and D. Ebersolt<sup>1</sup>, <sup>1</sup>Constellium Aerospace and Transportation, Kirkland, WA, <sup>2</sup>CRV, Constellium LLC, Voreppe, France, <sup>3</sup>Constellium Research Center, Voreppe, France

• Lunch On Own •

Additive Manufacturing V 1:00 p.m.–4:30 p.m. Meeting Room: 201A

**Session Chair:** 

Mr. Zach Loftus Lockheed Martin Space Systems Littleton, CO USA

### 1:00 p.m.

A Novel Additive Manufacturing Process Based on Wire and Plasma: Dr. Hilde Løken Larsen, M. Mathisen, P. Almeida, Mr. Pedrum Sodouri and Francisco Vega, Norsk Titanium AS, Honefoss, Norway

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

### 1:30 p.m.

**Early Insertion of Additive Manufacturing on Spacecraft Components:** Mr. Suraj Rawal and **Elliot Goldman**, Lockheed Martin Space Systems, Denver, CO

### 2:00 p.m.

**Process Refinement to Improve NDI in Additively Manufactured Components: Mr. Hank Phelps**, Lockheed-Martin, Marietta, GA

### 2:30 p.m.

**Deployment of Additive Manufacturing at Lockheed Martin Space Systems Company: Mr. Zach Loftus**, N/A Slade Gardner, Mr. Suraj Rawal and N/A Ken Marts, Lockheed Martin Space Systems, Littleton, CO

> 3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

### 3:30 p.m.

Material Measurements Research for Additive Manufacturing: Dr. Richard Ricker, Material Measurement Laboratory, National Institute of Standards and Technology, Gaithersburg, MD

### 4:00 p.m.

**The Development of Electron Beam Melting for High-Volume Production: Dr. Francisco Medina**, Arcam, Naperville, IL

### Engineering TBCs and Abradables 1:00 p.m.–4:50 p.m. Meeting Room: 102B

### **Session Chairs**:

**Mr. Yuk-Chiu Lau** General Electric Global Research Niskayuna, NY USA

**Jeff Smith** Material Processing Technology Norton Shores, MI USA

### 1:00 p.m.

Investigation on Plasma Sprayed CoNi-CrAlY-BN-Polyester Abradable Coating Consistency using In-flight Particle Diagnostics: Dr. Eric Irissou<sup>1</sup>, Prof. Christian Moreau<sup>2</sup> and Dr. Rogerio S. Lima<sup>3</sup>, <sup>1</sup>National Research Council Canada, Boucherville, QC, Canada, <sup>2</sup>Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada, <sup>3</sup>National Research Council of Canada (NRC), Boucherville, QC, Canada

### 1:20 p.m.

Microstructure and Properties of porous Abradable Alumina Coatings flame-sprayed by Semi-molten Particles: Prof. Chang-Jiu Li, Ms. Jiao Zou, Mr. Hui-Bin Huo, Prof. Cheng-Xin Li, Prof. GuanJun Yang and Ms. Jian-Tao Yao, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 1:40 p.m.

Influence Of APS Process Parameters On Morphologies Of YSZ-Polyester Abradable Coatings: Mrs. Delphine Aussavy<sup>1</sup>, Dr. Rodolphe BOLOT<sup>1</sup>, Prof. Ghislain Montavon<sup>1</sup>, Prof. François Peyraut<sup>2</sup>, Mr. Gregory Szyndelman<sup>3</sup>, Dr. Julien Gurt-Santanach<sup>4</sup> and Dr. Serge Selezneff<sup>5</sup>, <sup>1</sup>IRTES-LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France, <sup>2</sup>M3M-LERMPS, UTBM, Belfort, France, <sup>3</sup>Oerlikon Metco, Wohlen, Switzerland, <sup>4</sup>TURBOMECA, Bordes, France, <sup>5</sup>SNECMA, Moissy-Cramayel, France

### 2:00 p.m.

Application of FEM for the Estimation of Thermo-Mechanical Properties of Plasma Sprayed Composite Coatings: Dr. Rodolphe BOLOT<sup>1</sup>, Ms. Delphine Aussavy<sup>2</sup> and Prof. Ghislain montavon<sup>1</sup>, <sup>1</sup>IRTES-LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France, <sup>2</sup>University of Technology of Belfort-Montbéliard, Belfort, France

### 2:20 p.m.

**AFM Study of the Faceting of Ceramic Splats during Thermal Exposure for designing high sintering-resistance TBCs: Dr. Tao Liu**, Dr. Xiao-Tao Luo, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 2:40 p.m.

High Efficiency Deposition of the Porous Ceramic Abradable Coating using a High Energy Plasma Torch: Jianming Liu, Jianming Liu, Mr. Yueguang Yu, Beijing General Research Institute of Mingning & Metellurgy (BGRIMM), Beijing, China

> 3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

### 3:30 p.m.

Formation of a continuous  $\beta$ -NiAl layer near the interface in a  $\gamma$ + $\beta$  MCrAlY: Dr. Kang Yuan<sup>1</sup>, Prof. Ru Lin Peng<sup>1</sup> and Dr. Xin-Hai Li<sup>2</sup>, <sup>1</sup>Linkoping University, Linkoping, Sweden, <sup>2</sup>Material Technology, Research & Development, Siemens Industrial Turbomachinery AB, Finspong, Sweden

### 3:50 p.m.

High Temperature Oxidation of Cold Gas Sprayed Bond Coats for Tbc Application: Prof. Carlos R. C. Lima<sup>1</sup>, Mr. V. Crespo<sup>2</sup>, Dr. I. G. Cano<sup>2</sup>, Dr. Sergi Dosta<sup>2</sup>, Ms. M.J.X. Belem<sup>1</sup> and Prof. Josep M. Guilemany<sup>2</sup>, <sup>1</sup>College of Engineering, UNIMEP—Methodist University of Piracicaba, Santa Bárbara d'Oeste,

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

Brazil, <sup>2</sup>Dept. de Ciència dels Materials i Enginyeria Metal·lúrgica, Thermal Spray Centre (CPT)—Universitat de Barcelona, Barcelona, Spain

### 4:10 p.m.

A Comparison of the Thermal Properties of ZrO2-Ln2O3 (Ln – Y, La, Nd, Sm, Gd) Thermal Barrier Coatings: Mr. Ivan Mazilin<sup>1</sup>, Dr. Lev Baldaev<sup>2</sup> and Prof. Dmitri Drobot<sup>3</sup>, <sup>1</sup>TSPC Ltd., Moscow, Russia, <sup>2</sup>TSPC, Ltd., Moscow, Russia, <sup>3</sup>Lomonosov Moscow University of Fine Chemical Technology, Moscow, Russia

### 4:30 p.m.

Hybrid HVOF and High Power Plasma Spray Gun Coating Advancements for Aero and Land Based Gas Turbine Engine Applications: Mr. Ludwig Guggenheim<sup>1</sup>, Mr. Ralph Herber<sup>1</sup>, Mr. Adrian Vogel<sup>1</sup> and Dr. Robert Gansert<sup>2</sup>, <sup>1</sup>AMT AG, Dottingen, Switzerland, <sup>2</sup>Advanced Materials & Technology Services, Inc., Simi Valley, CA

Engineering, Protection and Repair of Aircraft Structural Parts 4 1:00 p.m.–4:50 p.m. Meeting Room: 102A

### **Session Chair:**

**Dr. Julio Villafuerte** Centerline (Windsor) Limited Windsor, ON Canada

### 1:00 p.m.

**Development Of A Two-Stage Hybrid Technology For Repairing Turbine Blades: Dr. Martin Nicolaus**, Dr. Kai Möhwald and Prof. Hans J. Maier, Institute of Materials Science, Leibniz University of Hannover, Garbsen, Germany

### 1:20 p.m.

Thermal Exposure Testing of a Multilayer Oxidation Protection System for Gamma-TiAl: Prof. Kirsten Bobzin, Mr. Mehmet Öte and Mr. Thomas Frederik Linke, Surface Engineering Institute, RWTH Aachen University, Aachen, Germany

### 1:40 p.m.

HVOF and HVAF Coatings of nano-agglomerated Tungsten Carbide—Cobalt powders for Water Droplet Erosion Application: Dr. Fariba Tarasi<sup>1</sup>, Mr. Mohammad- Sadegh mahdipoor<sup>1</sup>, Prof. Ali Dolatabadi<sup>2</sup>, Prof. Mamoun medraj<sup>2</sup> and Prof. Christian Moreau<sup>2</sup>, <sup>1</sup>MIE, Concordia University, Montréal, QC, Canada, <sup>2</sup>Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada

### 2:00 p.m.

Wear Characteristics of Mixed Lubricious Oxide Coatings: Dr. Satish Dixit<sup>1</sup>, Dr. Osman Levent Eryilmaz<sup>2</sup> and Dr. Ali Erdemir<sup>2</sup>, <sup>1</sup>Plasma Technology Inc., Torrance, CA, <sup>2</sup>Argonne National Lab, Chicago, CA

### 2:20 p.m.

In-Situ Observation Of Laves Phase Precipitation And Oxidation Of HVOF Deposited Tribaloy<sup>™</sup> T-800 (CoMoCrSi alloy) Coatings: Mr. Andrew Vackel<sup>1</sup>, Mr. David Lee<sup>2</sup> and Prof. Sanjay Sampath<sup>3</sup>, <sup>1</sup>Materials Science and Engineering, Stony Brook University, Center for Thermal Spray Research, Stony Brook, NY, <sup>2</sup>Kennametal Stellite, Goshen, IN, <sup>3</sup>Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY

### 2:40 p.m.

Kinetic Metallization<sup>™</sup> of Tungsten Carbide Wear Resistant Coatings: Dr. Ralph Tapphorn, Mr. Howard Gabel and Mr. Travis Crowe, Inovati, Santa Barbara, CA

> 3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

### 3:30 p.m.

**Non Line of Sight Chrome Alternatives for High Strength Steel Substrates: Mr. David Webb**, R&D, ES3, Clearfield, UT

### 3:50 p.m.

Low Hydrogen Embrittlement (LHE) Alkaline Zinc Nickel (Zn-Ni) Plating: Mr. Craig Pessetto, R&D, ES3, Clearfield, UT

### 4:10 p.m.

Dimensional Restoration of High-Valued Military Components Using Kinetic Metallization<sup>™</sup>: Dr. Ralph Tapphorn, Mr. Howard Gabel and Mr. Travis Crowe, Inovati, Santa Barbara, CA

### 4:30 p.m.

**Eliminating Hexavalent Cr Emissions in Thermal Spray Alloys: Dr. Justin Cheney**, SCOPERTA, INC., San Diego, CA

Failure Analysis of Aerospace Components 1:00 p.m.–3:00 p.m. Meeting Room: 202A

> **Session Chair:** Mr. Brian Boyette NAVAIR Cherry Point, NC USA

### 1:00 p.m.

**INVITED: Failure Analysis in the Aerospace Industry—What's Next?: Dr. Daniel Dennies**, Materials & Corrosion, Exponent—Failure Analysis Associates, Irvine, CA

# TECHNICAL PROGRAM • THURSDAY, MAY 14, 2015

### 1:30 p.m.

Virtual Failure Analysis of an Aerospace Aluminum Alloy Component: Dr. JT Staley, Corporate Technology, Element Materials Technology, New Berlin, WI

### 2:00 p.m.

**Caustic Embrittlement Cracking on a Helicopter Tail Rotor Output Shaft: Mr. Robert Figueroa**, Bell Helicopter Textron Inc., Fort Worth, TX

### 2:30 p.m.

Mechanical Electrochemical Study of Susceptibility to Stress Corrosion Cracking of Aeronautical Alloys Al6061-T6 and Inconel 600: Ms. Catalina Jaramillo Isaza, Dr. Facundo Almeraya and Dr. Citlalli Gaona Tiburcio, Aeronautical Materials, Universidad Autonoma de Nuevo Leon, Apocada, Nuevo León, Mexico

3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

> Titanium Alloy Technology II 1:00 p.m.–4:30 p.m. Meeting Room: 201B

### **Session Chairs:**

**Dr. Don Li** RTI International Metals, Inc. Niles, OH USA

> **Mr. Eric Bono** Summit Materials, LLC Mc Donald, PA USA

### 1:00 p.m.

**Development of New High Strength Alloy: Titanium 5Al-5V-5Mo-3Cr: Mr. Robert Briggs**, The Boeing Company, Seattle, WA

### 1:30 p.m.

**On the Influence of Microstructure on the Mechanical Behaviour of Ti-5Al-5Mo-5V-3Cr: Dr. Nicholas G. Jones**<sup>1</sup>, Dr. David Dye<sup>2</sup> and Prof. Trevor Lindley<sup>2</sup>, <sup>1</sup>The University of Cambridge, Cambridge, United Kingdom, <sup>2</sup>Imperial College London, London, United Kingdom

### 2:00 p.m.

The Effect of Heat Treatment on the Structure and Fracture Behavior of VST5553 Titanium Alloy: Prof. Sergey Demakov, **Prof. Dmitry Gadeev** and Prof. Anatoly Illarionov, Heat Treatment and Physics of Metals, Ural Federal University named after the First President of Russia B.N. Yeltsin, Yekaterinburg, Russia

### 2:30 p.m.

Assessment of the High-Temperature Oxidation Performance of Ti-Based Systems via a Novel Combinatorial Approach: Mr. Peyman Samimi, Mr. David Brice, Mr. Yue Liu and Prof. Peter C Collins, Dept. of Materials Science & Engineering, University of North Texas, Denton, TX

> 3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

### 3:30 p.m.

Influence of Non-Equilibrium Structure on the Mechanical Properties of Heat-Resistant Titanium Alloy: Mrs. Maria Popova and Prof. Artemy Popov, Ural Federal University named after the First President of Russia B.N. Yeltsin, Yekaterinburg, Russia

### 4:00 p.m.

The Design of Hot-Isostatic Pressing Schemes for Ti-5Al-5Mo-5V-3Cr and their Effects on Microstructure and Fatigue Properties: Dr. Nataliya Perevoshchikova<sup>1</sup>, Dr. Christopher Hutchinson<sup>1</sup> and Prof. Xinhua Wu<sup>2</sup>, <sup>1</sup>Department of Materials Engineering, Monash Clayton University, Victoria, Australia, <sup>2</sup>Monash University, Notting Hill, Australia

# Thursday, May 14, 2015

Tribological, Oxidation, Corrosion Behavior of Aerospace-based Coatings 8:00 a.m.-11:30 a.m. Meeting Room: 102A

### Session Chair:

**Prof. Petri Vuoristo** Tampere University of Technology Tampere, Finland

### 8:00 a.m.

**Cold Spray and Reaction Sintering of Ti-TiAl3 Composite Coatings: Dr. Volf Leshchynsky**<sup>1</sup>, Dr. Oleksandra Bielousova<sup>2</sup> and Prof. Anatoli Papyrin<sup>3</sup>, <sup>1</sup>Institute for Diagnostic Imaging Research, University of Windsor, Windsor, ON, Canada, <sup>2</sup>DIPI Laboratory, Ecole Nationale d'Ingenieurs de Saint-Etienne (ENISE), Saint-Etienne, France, <sup>3</sup>Cold Spray Technology, Albuquerque, NM

### 8:20 a.m.

**The Micro Structure and Tribological Properties of Liquid-Fuel HVOF Sprayed Fine WC-CO-CR Coating: Mr. Rohit Upadhyaya**<sup>1</sup>, Dr. Sharad Shrivastava<sup>1</sup>, Mr. S.C Modi<sup>2</sup> and Mr. A Modi<sup>2</sup>, <sup>1</sup>Birla Institute of Technology and Science ,Pilani INDIA, Pilani, India, <sup>2</sup>R&D, Metallizing Equipment Company, Jodhpur, India

# **TECHNICAL PROGRAM • THURSDAY, MAY 14, 2015**

### 8:40 a.m.

High Temp. Coatings Based on Aluminum Phosphate: Dr. Lingyan Kong, Division of Surface Engineering, Institute of metal research, CAS, Shenyang, China

### 9:00 a.m.

**Preparation and Oxidation Behavior Of Thermal** Barrier Coatings with a TiAl3 Bond Coat on  $\gamma$ -TiAl Alloy: Prof. Tianying Xiong, DIVISION OF SURFACE ENGINEERING, Institue of metal research, CAS, SHENYANG, China

### 9:20 a.m.

**Effect Of Particle Morphology On The Tribological** Behavior Of Cold Sprayed Al MMC Coatings: Mr. J. Michael Shockley<sup>1</sup>, Prof. Richard R. Chromik<sup>1</sup>, Dr. Sylvie V. Descartes<sup>2</sup> and Dr. Phuong Vo<sup>3</sup>, <sup>1</sup>Mining and Materials Engineering, McGill University, Montreal, QC, Canada, <sup>2</sup>Laboratoire de Mécanique des Contacts et des Structures, INSA de Lyon, Lyon, France, <sup>3</sup>National Research Council Canada, Boucherville, Montreal, QC, Canada

### 9:40 a.m.

Preparation and Oxidation Behavior of a TiAl3 Coat on TiAl Alloy by Cold Spray: Prof. Tianying Xiong, DIVISION OF SURFACE ENGINEERING, Institute of metal research, CAS, Shenyang, China

10:00 a.m.-10:30 a.m. Refreshment Break • Meeting Space Foyer •

### 10:30 a.m.

LaMgAl11019 Coating for Thermal Barrier Applications Produced by EB-PVD: Dr. Armen Kuzanyan<sup>1</sup>, Silva Petrosyan<sup>2</sup>, Georgi Badalyan<sup>1</sup>, Astghik Kuzanyan<sup>1</sup> and Prof. Vassilis Stathopoulos<sup>3</sup>, <sup>1</sup>MS, Institute for Physical Research, National Academy of Sciences, Ashtarak, Armenia, <sup>2</sup>LLFS, Institute for Physical Research, National Academy of Sciences, Ashtarak, Armenia, <sup>3</sup>Department of Electrical Engineering, Technological Educational Institute of Sterea Ellada, Psachna Chalkida, Greece

### 10:50 a.m.

Preparation of Inorganic Ceramic Coatings on γ-TiAl Alloys: Dr. Lingvan Kong, DIVISION OF SUR-FACE ENGINEERING, Institute of metal research, CAS, Shenyang, China

### 11:10 a.m.

**Effects of the Heat Treatments on the Corrosion** Rate of Ni-base Alloy Coatings Applied by Thermal Spray: Dr. José Cabral<sup>1</sup>, Mrs. Jamnie Achem<sup>1</sup>, Dr. Facundo Almeraya<sup>2</sup>, Dr. Patricia Zambrano<sup>3</sup>, Dr. Carlos Poblano<sup>4</sup> and Dr. Citllalli Gaona<sup>2</sup>, <sup>1</sup>Universidad Autónoma de Nuevo León, San Nicolás de los Garza, Mexico, <sup>2</sup>Aeronautical Materials, Universidad Autonoma de Nuevo Leon, Apocada, Nuevo León, Mexico, <sup>3</sup>Facultad de Ingeniería Mecánica y Eléctrica, Universidad Autónoma de Nuevo León, San Nicolas de los Garza, Mexico, <sup>4</sup>Centro de Tecnologia Avanzada, El Marques, Mexico

# **DAVID J. CHELLMAN SCHOLARSHIP**



ASM Materials Education Foundation is pleased to announce a recently established scholarship by Mrs. Arline Denny in loving memory of her husband David J. Chellman.

As a long-standing Senior Technical Fellow with Lockheed Martin Corporation, a life

member of ASM International and enthusiastic member of the AeroMat Conference Organizing Committee for 25 years, David J. Chellman will be missed by all of those who were touched by his work in the industry.

The new scholarship is an expression of his commitment to education and material science and the engineering community at large. It will be awarded to one individual in the amount of \$2,500 and the winner will be judged on academic merit and financial need.

To honor his memory, donations are now being accepted towards the David J. Chellman scholarship. For more information please contact Nichol Campana Nichol.campana@asminternational.org at or 800-336-5152 X 5506.

# **EDUCATION COURSES**

Improve your materials knowledge by taking an ASM Education short course at AeroMat. Taught by industry experts, these interactive learning experiences will help you stay up-to-date and competitive while getting the most from the AeroMat Conference and Exposition.

Registration and Courses will be held at the Hyatt Regency Long Beach • Thursday, May 14, 2015

Education Short Course registration will be from 8:00 a.m.-10:00 a.m. in the Seaview Foyer

Education Short Course Pricing Member: \$525.00 • Non-Member: \$725.00 • Student: \$275.00

# ADDITIVE MANUFACTURING SYSTEMS

Instructor: Francisco Medina, PhD, ARCAM/ORNL MDF

### **Course Description**

The course, Additive Manufacturing Systems, deals with various aspects of additive, subtractive, and joining processes to form three-dimensional parts with applications ranging from prototyping to production. Additive manufacturing (AM) technologies fabricate three-dimensional (3D) parts using layer-based manufacturing processes directly from computer-aideddesign (CAD) models. Direct digital manufacturing (DDM) or rapid manufacturing (RM) is the use of AM technologies in direct manufacturing of end-use parts. In this course, you will learn about a variety of AM and other manufacturing technologies, their advantages and disadvantages for producing both prototypes and functional production quality parts, and some of the important research challenges associated with using these technologies.

Upon completion of this course, each student should be able to:

- Provide a comprehensive overview of AM technologies including descriptions of related technologies including design and AM-specific software and post-processing/ part finishing approaches.
- Discuss the wide variety of new and emerging applications like microscale AM, medical applications, direct printing of electronics and Direct Digital Manufacturing of end-use components.
- Explain the capabilities, limitations, and basic principles of alternative AM technologies.
- Evaluate and select appropriate AM technologies for specific applications.
- Apply AM techniques to a challenging rapid manufacturing application.
- Identify, explain, and prioritize some of the important research challenges in AM.

# FRICTION STIR WELDING & PROCESSING

Instructors: Tony Reynolds and Yuri Hovanski

### **Course Description**

Friction stir welding (FSW) was invented by TWI, Cambridge, UK and patented in 1991. In the last twenty years, the research community has made significant advances in understanding of the process, and numerous industrial applications have been taken to full implementation. During the same period, friction stir processing (FSP) has been developed in parallel with FSW, and essentially employs FSW tooling to perform local thermomechanical treatments rather than to make joints

The scientific and technical literature is rich with information on joining of aluminum, steel, titanium, magnesium, metal matrix composites, and even superalloys as well as generic information on process fundamentals. The goal of this course is to provide participants with the essence of the accumulated FSW/FSP knowledge: both fundamental and practical. This course is designed to provide a basic understanding of the process and the linkage to performance by introducing aspects from basic process design, controls, tools, and metallurgical aspects. Although the course is general in nature, aerospace applications will be emphasized. 27th AeroMat Conference and Exposition



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# WELCOME

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n behalf of the ASM Thermal Spray Society (TSS), the German Welding Society (DVS), and the International Institute of Welding (iiw), we welcome you to the International Thermal Spray Conference and Exposition 2015. ITSC is where the global thermal spray community meets and conducts business. This year, ITSC 2015 is co-located with AeroMat and IMS/Microstructural Characterization of Aerospace Materials and Coatings offering 3x the technical programming, 3x exhibiting companies and 3x the connections, all for the price of one show!

During our 4 days together, you will learn the latest from industry leaders who will provide opportunities to explore and broaden your specific interests and help

achieve professional goals. For students and new professionals involved in thermal spray, this conference will provide invaluable networking opportunities that will serve you for years to come. For our exhibitors, your support of advancements in equipment, materials and services plays a critical role in ITSC's success.

We have many new and exciting features planned for this year's conference, including a special presentation by Dr. John Grotzinger, Chief Scientist and Head of Strategic Planning for the Mars Rover Mission, an evening with fellow conference attendees aboard the historic Queen Mary, and much more!

Sincerely,

General Chairs: **C. Moreau,** FASM, Concordia University **W. Krommer,** The Linde Group Technical Chairs: **D. Puerta,** Curtiss-Wright **K. Bobzin,** RWTH Aaechen University

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# 2015 ITSC ORGANIZING COMMITTEE/PROCEEDINGS EDITORS

Special thanks to the ITSC 2015 technical program volunteers for another outstanding conference. Your hard work and dedication is greatly appreciated

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Thank You to the ITSC 2015 Proceedings Editors

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> > Christian A. Widener South Dakota School of Mines and Technology

# ITSC 2015 5

# **CONGRATULATIONS TO THE 2015 TSS HALL OF FAME INDUCTEES**



Christian Coddet IRTES-LERMPS University of Technology of Belfort-Montbeliard eveloping inpovative thermal spray techniques and applic

For developing innovative thermal spray techniques and applications and for developing international collaboration programs dedicated to thermal spray research in developing countries.



Lech Pawlowski University of Limoges

For sustained and innovative thermal spray research and development and significant contributions to the fundamental and technical advancement of thermal spraying.



Sanjay Sampath, FASM Center for Thermal Spray Research State University of New York

For innovative interdisciplinary thermal spray research bridging the gap between fundamental science and industrial practice through better understanding of coating properties and the development of advanced diagnostic tools.

# **PAST HALL OF FAME INDUCTION WINNERS**

# THERMAL SPRAY HALL OF FAME INDUCTEES

The ASM International Thermal Spray Hall of Fame was established in 1993 by the ASM thermal Spray Society. Induction to the Hall of Fame is a means of recognizing and honoring outstanding leaders who have made significant contributions to the science, practice, education, management and advancement of thermal spray.

### 2015 Class of Inductees

Christian Coddet, University of Technology of Belfort-Montbeliard Lech Pawlowski, University of Limoges Sanjay Sampath, FASM, State University of New York

2014 Class of Inductees Mitchell R. Dorfman, FASM, Oerlikon Metco (US), Inc.

### 2013 Class of Inductees

M. Brad Beardsley, Caterpillar, Inc. Christian Moreau, FASM, National Research Council of Canada

### 2012 Class of Inductees

Frank J. Hermanek, *Praxair Thermal Spray Product* Elliott R. Sampson, *TAFA/Praxair Surface Technologies*<sup>†</sup>

### 2011 Class of Inductees

Peter Heinrich, *Linde Gas AG* Akira Ohmori, *Osaka University* Detlev H. H. Stöver, *Forschungszentrum Jülich GmbH* 

### 2010 Class of Inductees

Klaus Dieter Landes, *Universtat der Bundeswehr Muenchen* Andrew Nicoll

### 2009 Class of Inductees

Daryl E. Crawmer, FASM, Thermal Spray Technologies, Inc. Akira Nakahira, Tocalo Co., Ltd. Anatolii N. Papyrin, Cold Spray Technology, LLC

### 2008 Class of Inductees

Robert M. Gage, Union Carbide Corp.<sup>†</sup> Albert Kay, *FASM, ASB Industries, Inc.* 

**2007 Class of Inductees** Christopher C. Berndt, *FASM, James Cook University* 

### 2006 Class of Inductees

Atsushi Hasui, *Keio University* Mark Smith, FASM, *Sandia National Laboratories* Donald Yenni, FASM, *Union Carbide Corp.*<sup>†</sup>

### 2005 Class of Inductees

Heinrich Kreye, University of Federal Armed Forces

### 2004 Class of Inductees

Fred W. Gartner, Jr., *F. W.Gartner Thermal Spray Company*<sup>†</sup> Anthony J. Rotolico, *Englehard Surface Technology* 

Joachim V. Heberlein, University of Minnesota<sup>†</sup>

### 2003 Class of Inductees

Maher I. Boulos, University of Sherbrooke Douglas H. Harris, APS Materials Incorporated<sup>†</sup>

### 2002 Class of Inductees

Hans-Dieter Steffens, *University of Dortmund* Robert C. Tucker, Jr., *FASM, The Tucker Group, LLC* René David Wasserman, *Eutectic+Castolin*<sup>†</sup>

### 2001 Class of Inductees

 Vernon A. Cook, Metallizing Company of America (Mogul)<sup>†</sup>
Ferdinand J. Dittrich, Sulzer Metco (US) Inc.<sup>†</sup>
Hiroshi F. Nakahira, TOCALO Co., LTD<sup>†</sup>

### 2000 Class of Inductees

No inductees awarded this year.

### 1999 Class of Inductees

Erich F. Lugscheider, Aachen University

### 1998 Class of Inductees

Pierre Léon Fauchais, *University of Limoges* Moses A. Levinstein, *General Electric Aircraft Engine*<sup>†</sup> Herbert† and Marlies Nussbaum, *Plasma-Technik* 

### 1997 Class of Inductees

Robert E. Mahood, *St. Louis Metallizing, Inc.*<sup>†</sup> Erich Muehlberger, *Sulzer Metco, Inc.* Jack Ritchie, *Bender Machine, Inc.* 

### 1996 Class of Inductees

Rea A. Axline, *Metco, Inc.*<sup>†</sup> James A. Browning, *DRACO, Inc.* Reginald McPherson, *Monash University*<sup>†</sup> George H. Smith, *Union Carbide Corp.*<sup>†</sup>

### 1995 Class of Inductees

Jack Kittle, *H.C. Starck, Inc.*<sup>†</sup> Walter B. Meyer, *St. Louis Metallizing, Inc.*<sup>†</sup>

### 1994 Class of Inductees

Herbert Herman, *State University of New York* Daniel R. Marantz, *Flame-Spray Industries, Inc.* Merle L. Thorpe, *TAFA, Inc.* William E. Ballard, *Metallisation, Ltd.*<sup>†</sup> Max Ulrich Schoop, *Inventor*<sup>†</sup>

(†-deceased)

# **PROGRAM AT-A-GLANCE**

# **NETWORKING OPPORTUNITIES**

Monday					
Morning Refreshment Break	10:00 a.m10:30 a.m., Meeting Space Foyer				
Lunch	12:00 p.m.–1:15 p.m., Exhibit Halls A&B				
Afternoon Refreshment Break	3:00 p.m.–3:30 p.m., Exhibit Halls A&B				
Expo Welcome Reception	5:30 p.m.–7:00 p.m., Exhibit Halls A&B				
Tuesday					
Morning Refreshment Break	10:00 a.m.–10:30 a.m., Exhibit Halls A&B				
Lunch	12:00 p.m.–1:00 p.m., Exhibit Halls A&B				
Afternoon Refreshment Break	3:30 p.m.–4:00 p.m., Exhibit Halls A&B				
Social Event*	7:00 p.m.–10:00 p.m., Queen Mary				
Wednesday					
Morning Refreshment Break	10:00 a.m.–10:30 a.m., Exhibit Halls A&B				
Allied Facility Tour	10:45 a.m.–1:15 p.m., departing from Hyatt Regency. Preregistration required.				
Afternoon Refreshment Break	3:00 p.m.–3:30 p.m., Exhibit Halls A&B				
Thursday					
Morning Refreshment Break	10:00 a.m.–10:30 a.m., Meeting Space Foyer				

\*Ticket Sold Separately

# **EXPOSITION HOURS/ACTIVITIES**

Monday	12:00 p.m.–7:00 p.m.
V.I.P. Expo Tour	10:15 a.m.–11:15 a.m. (qualified attendees were notified regarding acceptance )
Luce ele	
Lunch	12:00 p.m1:00 p.m.
Plenary	1:30 p.m.–3:00 p.m.
Refreshment Break	3:00 p.m.–3:30 p.m.
Welcome Reception	5:30 p.m.–7:00 p.m.
Tuesday	9:00 a.m4:00 p.m.
Refreshment Break	10:00 a.m10:30 a.m.
AeroMat Plenary	10:30 a.m.–12:00 p.m.
Lunch	12:00 p.m.–1:00 p.m.
Plenary	1:00 p.m.–3:30 p.m.
Refreshment Break	3:30 p.m4:00 p.m.
Wednesday	9:00 a.m4:00 p.m.
Refreshment Break	10:00 a.m10:30 a.m.
Refreshment Break	3:00 p.m.–3:30 p.m.

Lunches provided Monday and Tuesday on the Exhibit Floor. Attenees on own for lunch Wednesday

# PROGRAM AT-A-GLANCE

	Monday May 11		Tuesday May 12		Wednesday May 13		Thursday May 14
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.
Advanced Coatings for the Aerospace Industry (JOINT SYMPOSIUM with AeroMat)	Suspension/ Solution and Plasma- Spray-PVD TBCs - Novel TBC Materials Room: 102A 8:00 a.m.– 12:10 p.m.	Thermal Barrier Coatings (TBCs) Room: 102A 3:30 p.m.– 5:30 p.m.	Engineering, Protection and Repair of Aircraft Structural Parts 1 Room: 102A 8:00 a.m.– 11:30 a.m.	Engineering, Protection and Repair of Aircraft Structural Parts 2 Room: 102A 4:00 p.m.– 5:40 p.m.	Engineering, Protection and Repair of Aircraft Structural Parts 3 Room: 102A 8:00 a.m.– 10:00 a.m. Bond Coat Development for TBCs Room: 102B 8:00 a.m.– 9:40 a.m.	Engineering, Protection and Repair of Aircraft Structural Parts 4 Room: 102A 1:00 p.m.– 4:50 p.m. Engineering TBCs and Abradables Room: 102B 1:00 p.m.– 4:50 p.m.	Tribological, Oxidation, Corrosion Behavior of Aerospace- based Coatings Room: 102A 8:00 a.m 11:50 a.m.
Fundamentals /R&D	Suspension Plasma Spray Room: 102B 8:00 a.m.– 12:10 p.m. Cold Spray Metals and Ceramics Room: 102C 8:00 a.m.– 12:10 p.m. HVOF and HVAF Room: 104A 8:00 a.m.– 11:50 a.m.	Suspension & Solution Thermal Spray Room: 102B 3:30 p.m 5:30 p.m. Cold Spray Processing Room: 102C 3:30 p.m 5:30 p.m. Arc Spray Room: 104A 3:30 p.m 5:10 p.m.	Cold Spray: Simulation and Particle Impact Room: 102B &:00 a.m 11:50 a.m. Novel Processes Room: 102C &:00 a.m 11:50 a.m. Modeling & Simulation Room: 104A &:00 a.m 11:50 a.m.	Cold Spray Processing 2 Room: 102B 4:00 p.m.– 5:40 p.m. Suspension & Solution Plasma Spray Room: 102C 4:00 p.m.– 5:20 p.m. Modeling & Simulation 2 Room: 104A 4:00 p.m.– 5:20 p.m.	Cold Spray Processing 3 Room: 102C 8:00 a.m 10:00 a.m. Characterization & Testing: Mechanical Properties Room: 104A 8:00 a.m 10:00 a.m. Surface Preparation Room: 104B 8:00 a.m 9:40 a.m.	Cold Spray & Splat Formation Room: 102C 1:00 p.m.– 4:10 p.m. TBCs and Electrical Properties Room: 104A 1:00 p.m.– 4:50 p.m.	Diagnostics & Characterization Room: 102B 8:00 a.m.– 11:30 a.m. Materials Room: 102C 8:00 a.m.– 11:00 a.m. Materials and Technology Room: 104A 8:00 a.m.– 11:30 a.m.
Plenary		Exhibit Halls A&B 1:30 p.m.– 3:00 p.m.		Exhibit Halls A&B 1:00 p.m.– 3:30 p.m.			
Thermal Spray Applications	Corrosion 1 Room: 101A 8:00 a.m.– 11:50 a.m. Testing and Characterization 1 Room: 101B 8:00 a.m.– 11:30 a.m.	Miscellaneous Room: 101A 3:30 p.m.– 5:30 p.m. Automotive and Heavy Duty Truck Room: 101B 3:30 p.m.– 5:30 p.m.	Energy 1 Room: 101A 8:00 a.m 11:30 a.m. Testing and Characterization 2 Room: 101B 8:00 a.m 9:00 a.m. Biomedical 1 Room: 101B 10:30 a.m 11:50 a.m.	Energy 2 Room: 101A 4:00 p.m.– 5:20 p.m. Miscellaneous 2 Room: 101B 4:00 p.m.– 5:40 p.m.	Energy 3 Room: 101A 8:00 a.m.– 10:00 a.m. Biomedical 2 Room: 101B 8:00 a.m.– 9:40 a.m.	Energy 4 Room: 101A 1:00 p.m.– 4:30 p.m. Complementary Process Room: 101B 1:00 p.m.– 4:50 p.m.	Corrosion 2 Room: 101A 8:00 a.m.– 10:50 a.m. Electronics and Semi Conductor Room: 101B 8:00 a.m.– 12:10 p.m.
Young Professionals Session and Oerlikon Metco Young Professionals Award					Poster Session Exhibit Halls A&B 10:00 a.m 11:00 a.m. ITSC Young Professionals Session Room: 104B 11:00 a.m 12:00 p.m.		

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ITSC 2015

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

We would like to thank the Organizing Committee, Technical Program Volunteers, Proceedings Editors, Session Chairs, and Speakers for their time and efforts in creating an outstanding ITSC Conference and Exposition.

Proceedings can be found online at asminternational.org. See page 3 for download instructions.

## Monday, May 11, 2015

### Cold Spray Metals and Ceramics 8:00 a.m.-12:10 p.m. Meeting Room: 102C

### **Session Chairs:**

**Dr. Julio Villafuerte** Centerline (Windsor) Limited Windsor, ON Canada

> **Dr. Oliver Stier** Siemens AG Berlin, Germany

### 8:00 a.m.

Understanding the Fatigue Response of Cold Sprayed Ni based Superalloy Coatings: Dr. Dheepa Srinivasan<sup>1</sup>, Dr. Joydeep Pal<sup>2</sup>, Dr. Prasad R.V.S<sup>1</sup>, Mr. Santhosh Bangera<sup>2</sup>, Dr. Yuk-Chiu Lau<sup>3</sup> and Mr. Lawrence levy<sup>4</sup>, <sup>1</sup>Repair Development Center, GE Power & Water, Bangalore, India, <sup>2</sup>Materials & Process Engineering, GE Power & Water, Bangalore, India, <sup>3</sup>Materials and Process Engineering, GE Power and Water, Schenectady, NY, <sup>4</sup>Repair Depevopment Centre, GE Power and Water, Greenville, SC

### 8:20 a.m.

**Microstructure and Properties of 6061 and 7075 Aluminum Alloys Deposited by High-Pressure Cold Spray: Mr. M. Reza Rokni**<sup>1</sup>, Dr. Christian A. Widener<sup>1</sup>, Dr. Grant A. Crawford<sup>1</sup>, Dr. Michael K. West<sup>1</sup>, Mr. Victor K. Champagne<sup>2</sup> and Mr. Michael Carter<sup>1</sup>, <sup>1</sup>South Dakota School of Mines and Technology, Rapid City, SD, <sup>2</sup>U.S. Army Research Laboratory, Aberdeen Proving Ground, MD

### 8:40 a.m.

**Structure and Mechanical Properties of Thick Copper coating made by Cold Spray: Dr. Volf Leshchynsky**<sup>1</sup>, Dr. Roman Gr. Maev<sup>1</sup>, Dr. Emil Strumban<sup>1</sup>, Dr. Dmitry Dzhurinskiy<sup>1</sup> and Dr. Elena Maeva<sup>2</sup>, <sup>1</sup>Institute for Diagnostic Imaging Research, University of Windsor, Windsor, ON, Canada, <sup>2</sup>Physics, University of Windsor, Windsor, ON, Canada

### 9:00 a.m.

Role of Precursor Properties in Cold Spray Coating Process: Mr. Vikram Varadaraajan and Prof. Pravansu Mohanty, Mechanical Engineering, University of Michigan, Dearborn, MI

### 9:20 a.m.

**Mechanical Properties of WC-25/17/12Co Cermets Sprayed by HVOF and CGS:** Mr. Miguel Couto<sup>1</sup>, **Dr. Sergi Dosta**<sup>1</sup>, Dr. I. G. Cano<sup>1</sup>, Dr. Amadeu Concustell<sup>1</sup>, Dr. Nuria Cinca<sup>1</sup> and Prof. Josep M. Guilemany<sup>2</sup>, <sup>1</sup>Dept. de Ciència dels Materials i Enginyeria Metal·lúrgica, Thermal Spray Centre (CPT)—Universitat de Barcelona, Barcelona, Spain, <sup>2</sup>Thermal Spray Center, University of Barcelona, Barcelona, Spain

### 9:40 a.m.

**Erosive Wear Behavior of a Wc-Ni Composite Coating Deposited by Cold Spray:** Mrs. Sima Ahmad Aliokht<sup>1</sup>, **Prof. Richard R Chromik**<sup>1</sup>, Prof. Steve Yue<sup>1</sup>, Dr. Huseyin Aydin<sup>1</sup>, Dr. Praveena Manimunda<sup>1</sup> and Dr. Phuong Vo<sup>2</sup>, <sup>1</sup>Department of Mining and Materials Engineering, McGill university, Montreal, QC, Canada, <sup>2</sup>National Research Council Canada, Boucherville, Montreal, QC, Canada

10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

### 10:30 a.m.

**Deposition Behavior and Film Property with Dif ferent Impact Velocity of Al2O3 Particle in Vacuum Kinetic Spraying System: Mr. Hyungkwon Park**, Mr. Illjoo Lee, Mr. Jinyoung Kim and Prof. Changhee Lee, Division of Materials Science and Engineering, Hanyang University, Seoul, South Korea

### 10:50 a.m.

The Impact Behavior Alteration Depending on the Process Conditions in Kinetic Spraying of Al2O3 Particles: Mr. Jaeick Kim, Mr. Gyeongjun Byun and Prof. Changhee Lee, Division of Materials Science and Engineering, Hanyang University, Seoul, South Korea

### 11:10 a.m.

**Room Temperature Solid-State Deposition of Alumina: Dr. Pylin Sarobol**, Dr. Michael Chandross, Dr. Jay Carroll, Dr. William Mook, Dr. Daniel Bufford, Dr. Paul Kotula, Ms. Bonnie McKenzie, Dr. Brad Boyce, Dr. Khalid Hattar and Dr. Aaron Hall, Sandia National Laboratories, Albuquerque, NM

### 11:30 a.m.

Preparation and Characterization of Transparent Hydrophobic Al2O3 Surface by Vacuum Cold Spray: Dr. Jie Li, Ms. Yu Zhang, Prof. Cheng-Xin Li, Prof. Xi-De Pan, Prof. Guan-Jun Yang, Xiao-Tao Luo and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 11:50 a.m.

Investigation of the Bonding Mechanisms of Al Coatings on Ceramic Substrates Deposited by Cold Gas Spraying and Magnetron Sputtering: Mr. Rico Drehmann<sup>1</sup>, Dr. Thomas Grund<sup>1</sup>, Prof. Thomas Lampke<sup>1</sup>, Prof. Bernhard Wielage<sup>1</sup>, Mrs. Christina Wüstefeld<sup>2</sup>, Dr. Mykhaylo Motylenko<sup>2</sup>, Mr. Gerhard Schreiber<sup>2</sup> and Prof. David Rafaja<sup>2</sup>, <sup>1</sup>Institute of Materials Science and Engineering (IWW), Chemnitz University of Technology, Chemnitz, Germany, <sup>2</sup>Freiberg University of Mining and Technology, Freiberg, Germany

> 12:10 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

Corrosion 1 8:00 a.m.-11:30 a.m. Meeting Room: 101A

### **Session Chairs:**

Dr. Shiladitya Paul TWI Cambridge, United Kingdom

Richard Vander Straten ES3 Syracuse, UT

### 8:00 a.m.

Analysis of Thermal Spraying in the Industries of Western Canada: Dr. André McDonald, Mechanical Engineering, University of Alberta, Edmonton, AB, Canada

### 8:40 a.m.

Twin Wire Arc Spray for Oil Field Tubulars: Mr. Joe L. Scott, ResOps LLC, Tomball, TX

### 9:00 a.m.

**Ultraflex(TM) Coatings for Protection of Non-Line of Sight Surfaces:** Mr. Douglas Kimball<sup>1</sup>, Jim faust<sup>1</sup> and **Mr. James Dezelle**<sup>2</sup>, <sup>1</sup>Kennametal, New Albany, IN, <sup>2</sup>Energy Americas Kennametal, Inc., New Albany, IN

### 9:20 a.m.

Sealers in Use With Micro Arc Oxidation for Rough Service Environments in the O&G Industry: Dr. Inbar Dag and Mr. Arie Laor, PCT, Haifa, Israel

### 9:40 a.m.

An Evaluation of WC-10% Ni Thermal Spray Powders and HVOF Coatings, Part I: Characteristics of Powders and HVOF Coatings: Dr. Jianhong He and Dr. Thomas Wolfe, R & d, Global Tungsten and Powders, Towanda, PA

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

### 10:30 a.m.

Enhancement of Wear and Corrosion Resistance of Carbide Based Coating Deposited by High-Velocity Liquid Fuel Thermal Spraying: Mr. Rohit Upadhyaya<sup>1</sup>, Dr. Sharad Shrivastava<sup>1</sup>, Mr. S.C Modi<sup>2</sup> and Mr. A Modi<sup>2</sup>, <sup>1</sup>Birla Institute of Technology and Science ,Pilani INDIA, Pilani, India, <sup>2</sup>R&D, Metallizing Equipment Company, Jodhpur, India

### 10:50 a.m.

Surface Modification by Means of Multilayer Systems and Micro-Milling Technology: Mr. Leif Hagen<sup>1</sup>, Prof. Wolfgang Tillmann<sup>1</sup>, Mr. Dominic Stangier<sup>1</sup>, Prof. Dirk Biermann<sup>2</sup> and Mr. Eugen Krebs<sup>3</sup>, <sup>1</sup>Institute of Materials Engineering, Technische Universität Dortmund, Dortmund, Germany, <sup>2</sup>Department of Machining Technology, TU Dortmund, Dortmund, Germany, <sup>3</sup>Department of Machining Technology, Technische Universitaet Dortmund, Dortmund, Germany

### 11:10 a.m.

Breaking Behavior of Oxide Scale on the LPPS Bond Coats Surface During Pre-treatment in Vacuum: Mr. Bang-Yan Zhang, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

> 12:10 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

### HVOF and HVAF 8:00 a.m.-11:50 a.m. Meeting Room: 104A

### **Session Chair:** Dr. Alfredo Valarezo Universidad San Francisco de Quito Quito, Ecuador

### 8:00 a.m.

**Development of Thin WC-12Co Coatings Manufactured by HVOF-spraying:** Prof. Wolfgang Tillmann, **Mr. Peter S. Hollingsworth**, Dr. Ingor Baumann and Mr. Marcel Laschitzki, Institute of Materials Engineering, Technische Universität Dortmund, Dortmund, Germany

### 8:20 a.m.

Processing Mapping and Comparison of High Velocity Oxy-Fuel (HVOF) Produced Damage Tolerant Coatings: Processing to Properties to Performance: Mr. Andrew Vackel<sup>1</sup> and Prof. Sanjay Sampath<sup>2</sup>, <sup>1</sup>Materials Science and Engineering, Stony Brook University, Center for Thermal Spray Research, Stony Brook, NY, <sup>2</sup>Materials Science and Engineering, Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY

### 8:40 a.m.

Metal-Ceramic Nanocomposite Coatings Produced by HVOF Thermal Spray and in-situ Precipitation of Ceramic Components for Tribological Applications: Dr. Robert Schulz<sup>1</sup> and Sylvio Savoie<sup>2</sup>, <sup>1</sup>Materials Science, Hydro-Quebec, Varennes, QC, Canada, <sup>2</sup>Hydro-Quebec, Varennes, QC, Canada

### 9:00 a.m.

Investigation of the Interface of Overlapping Splats for a WC-Based Cermet: Mr. Birger Hussong, Prof. Wolfgang Tillmann and Mrs. Vera Lünnemann, Institute of Materials Engineering, Technical University of Dortmund, Dortmund, Germany

### 9:20 a.m.

**Residual Stresses In WC-Co Coatings In As-Sprayed And Surface-Grinded Conditions: Dr. Vladimir Luzin**<sup>1</sup>, Dr. Alfredo Valarezo<sup>2</sup>, Mr. Andrew Vackel<sup>3</sup> and Prof. Sanjay Sampath<sup>4</sup>, <sup>1</sup>The Bragg Institute, Australian Nuclear Science and Technology Organisation, Sydney, Australia, <sup>2</sup>Mechanical Engineering, Universidad San Francisco de Quito, Quito, Ecuador, <sup>3</sup>Materials Science and Engineering, Stony Brook University, Center for Thermal Spray Research, Stony Brook, NY, <sup>4</sup>Materials Science and Engineering Department, Center for Thermal Spray Research, State University of New York at Stony Brook, Stony Brook, NY

### 9:40 a.m.

**Improving the Fatigue Resistance of Warm Sprayed WC-CoCr Coatings by Micro-Finishing: Prof. Wolfgang Tillmann**<sup>1</sup>, Dr. Jan Nebel<sup>1</sup>, Mr. Christopher Schaak<sup>1</sup>, Prof. Dirk Biermann<sup>2</sup>, Mr. Sebastian Goeke<sup>2</sup> and Mr. Goetz Matthaeus<sup>3</sup>, <sup>1</sup>Institute of Materials Engineering, TU Dortmund, Dortmund, Germany, <sup>2</sup>Institute of Machining Technology, TU Dortmund, Dortmund, Germany, <sup>3</sup>Thermico USA, Inc., Charlotte, NC

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

### 10:30 a.m.

Influence of the Surface Characteristics of Cr3C2-NiCr Coatings Sprayed by HVOF and HVAF on the Coefficient of Static Friction: Dr. Lutz-Michael Berger<sup>1</sup>, Mrs. Irina Shakhverdova<sup>2</sup>, Mr. Roberto Puschmann<sup>3</sup>, Mr. Matthias Gräfensteiner<sup>4</sup>, Prof. Erhard Leidich<sup>4</sup>, Ms. Saskia Schiefer<sup>4</sup> and Marco Gerlach<sup>4</sup>, <sup>1</sup>Fraunhofer IKTS, Dresden, Germany, <sup>2</sup>Fraunhofer Institute for Material and Beam Technology (IWS), Dresden, Germany, <sup>3</sup>Fraunhofer IWS, Dresden, Germany, <sup>4</sup>Chemnitz University of Technology, Chemnitz, Germany

### 10:50 a.m.

**Comparison of Residual Stress Generation in High Kinetic HVOF and HVAF Processes: Mr. Tommi Varis**<sup>1</sup>, Mr. Tomi Suhonen<sup>2</sup>, N/A Mika Jokipii<sup>1</sup> and Mr. Jarkko Metsäjoki<sup>2</sup>, <sup>1</sup>Materials and Manufacturing, VTT Technical Research Centre of Finland, Espoo, Finland, <sup>2</sup>Thermal Spray, VTT Technical Research Centre of Finland, Espoo, Finland

### 11:10 a.m.

**Tribological Properties of Hard Metal Coatings Sprayed by High Velocity Air Fuel Process: Dr. Christophe Lyphout**<sup>1</sup>, Mr. Kazuto Sato<sup>2</sup>, Šárka Houdková<sup>3</sup>, E. Smazalova<sup>2</sup>, Luca Lusvarghi<sup>4</sup>, Giovanni Bolelli<sup>4</sup> and Paolo sassatelli<sup>4</sup>, <sup>1</sup>Production Engineering, University West, Trollhättan, Sweden, <sup>2</sup>Thermal Spray Materials Dept., Fujimi Incorporated, Kakamigahara, Gifu Pref., Japan, <sup>3</sup>VZU Plzen, Plzen, Czech Republic, <sup>4</sup>Department of Engineering "Enzo Ferrari", University of Modena and Reggio Emilia, Modena, Italy

### 11:30 a.m.

**Evaluation of HVAF Sprayed Cr3C2 Based Coatings by Abrasion, Erosion and Cavitation Erosion Wear Tests: Mr. Ville Matikainen**<sup>1</sup>, Giovanni Bolelli<sup>2</sup>, Dr. Heli Koivuluoto<sup>1</sup>, Luca Lusvarghi<sup>2</sup> and Prof. Petri Vuoristo<sup>1</sup>, <sup>1</sup>Department of Materials Science, Tampere University of Technology, Tampere, Finland, <sup>2</sup>Department of Engineering "Enzo Ferrari", University of Modena and Reggio Emilia, Modena, Italy

> 12:10 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

### Suspension Plasma Spray 8:00 a.m.-12:10 p.m. Meeting Room: 102B

### Session Chair:

Dr. Filofteia-Laura Toma Fraunhofer Institute for Material and Beam Technology (IWS) Dresden, Germany

### 8:00 a.m.

**Comparison of Spray Techniques Depositing Fine Species: Prof. R. Vaßen**<sup>1</sup>, Stefan Rezanka<sup>2</sup>, Nadin Schlegel<sup>2</sup>, Dr. Georg Mauer<sup>2</sup> and Prof. Olivier Guillon<sup>2</sup>, <sup>1</sup>Institute of Energy and Climate Research (IEK-1), Forschungszentrum Jülich GmbH, Jülich, Germany, <sup>2</sup>Institut für Energie- und Klimaforschung IEK-1, Forschungszentrum Jülich GmbH, Jülich, Germany

### 8:20 a.m.

Investigation of Alumina and Yttria Coating Microstructures Manufactured by Suspension Plasma Spraying: Mrs. Emilie Aubignat<sup>1</sup>, Ms. Marie-Pierre Planche<sup>2</sup>, Dr. Alain Allimant<sup>3</sup>, Mr. Dominique Billières<sup>4</sup> and **Prof. Ghislain Montavon**<sup>5</sup>, <sup>1</sup>IRTES-LERMPS/ UTBM, Sevenans, France, <sup>2</sup>IRTES-LERMPS, UTBM, Sevenans, France, <sup>3</sup>Saint-Gobain C.R.E.E., Cavaillon, France, <sup>4</sup>Saint-Gobain Coating Solutions, Avignon, France, <sup>5</sup>IRTES-LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France

### 8:40 a.m.

Influence of Porosity on Thermal Properties of Columnar Suspension Plasma Sprayed Thermal Barrier Coatings: Mr. Ashish Milind Ganvir<sup>1</sup>, Dr. Nicholas Curry<sup>2</sup>, Dr. Nicolaie Markocsan<sup>3</sup>, Prof. Per Nylen<sup>2</sup>, Ms. Monika Vilemova<sup>4</sup> and Dr. Zdenek Pala<sup>5</sup>, <sup>1</sup>Production Technology, University West, Trollhattan, Sweden, Trollhattan, Sweden, <sup>2</sup>University West, Trollhattan, Sweden, <sup>3</sup>Production Engineering, University West, Trollhättan, Sweden, <sup>4</sup>Institute of Plasma Physics AS CR, Prague, Czech Republic, <sup>5</sup>IPP ASCR, Prague, Czech Republic

### 9:00 a.m.

**Thermal Sprayed Dense Ceramic Coating Cabricated by Using Fine Particle: Mr. Kazuto Sato** and Mr. Hiroyuki ibe, Thermal Spray Materials Dept., Fujimi Incorporated, Kakamigahara, Gifu Pref., Japan

### 9:20 a.m.

Low Cost Suspension Plasma Spraying of YSZ Coatings: Dr. Mohammed Shahien<sup>1,2</sup> and Dr. Masato Suzuki<sup>1</sup>, <sup>1</sup>Energy Technology Research Institute, National Institute of Advanced Industrial Science and Technology, AIST, Tsukuba, Ibaraki, Japan, <sup>2</sup>Central Metallurgical Research and Development Institute, CMRDI, Cairo, Egypt

10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

### 10:30 a.m.

**Control of Droplet Size in Suspension Plasma Spray Process: Dr. Masato Suzuki**<sup>1</sup> and Dr. Mohammed shahien<sup>2</sup>, <sup>1</sup>Energy Technology Research Institute, National Institute of Advanced Industrial Science and Technology, AIST, Tsukuba, Ibaraki, Japan, <sup>2</sup>Toyohashi University of Technology, Toyohashi, Japan

### 10:50 a.m.

Homogenization of Coating Properties in Three-Cathode Atmospheric Plasma Spraying by Use of Advanced Diagnostics and Numerical Simulation—Investigations of Suspension Plasma Spraying (SPS) Process: Dr. Stephan Zimmermann<sup>1</sup>, Mr. Sven Schmettlach<sup>1</sup>, Mr. Sebastian Weber<sup>1</sup>, Dr. Guenter Forster<sup>1</sup>, Prof. Klaus Landes<sup>1</sup>, Prof. Jochen Schein<sup>1</sup>, Mrs. Christin Lummer<sup>2</sup>, **Mr. Patrick Knödler<sup>2</sup>**, Mr. Simon Kresnik<sup>2</sup>, Dr. K. Möhwald<sup>2</sup> and Prof. Hans J. Maier<sup>2</sup>, <sup>1</sup>Lab for Plasma Technology (LPT), EIT 1, Universitaet der Bundeswehr Muenchen, Neubiberg, Germany, <sup>2</sup>Institute of Materials Science, Leibniz Universität Hannover, Garbsen, Germany

### 11:10 a.m.

Online Measurement of Size Distribution of In-flight Particles in the Suspension Plasma Spray Process: Mr. Ali Akbar Nozari, Prof. Ali Dolatabadi and Prof. Christian Moreau, Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada

### 11:30 a.m.

Influence of Plasma Radiation on Temperature Measurement of In-flight Particles in Suspension Plasma Spraying: Mr. Bishoy Samuel Aziz<sup>1</sup> and Dr. Christian Moreau<sup>2</sup>, <sup>1</sup>Mechanical Engineering, Concordia University, Montreal, QC, Canada, <sup>2</sup>MIE, Concordia University, Montreal, QC, Canada

### 11:50 a.m.

Effect of Substrate Curvature on In-flight Particle Characteristics in Suspension Plasma Spraying: Mr. Kourosh Pourang<sup>1</sup>, Prof. Christian Moreau<sup>2,3</sup> and Prof. Ali Dolatabadi<sup>3</sup>, <sup>1</sup>Concordia University, Montreal, QC, Canada, <sup>2</sup>National Research Council of Canada (NRC), Boucherville, QC, Canada, <sup>3</sup>Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada

> 12:10 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

Suspension/Solution and Plasma-Spray-PVD TBCs–Novel TBC Materials 8:00 a.m.-12:10 p.m. Meeting Room: 102A

### **Session Chairs:**

Mr. Brian Hazel Pratt & Whitney USA East Hartford, CT USA

**Dr. Rogerio S. Lima** National Research Council of Canada (NRC) Boucherville, QC Canada

### 8:00 a.m.

**Columnar Suspension Plasma Spray Thermal Bar rier Coatings: Influence of Suspension Properties and Bond Coat Preparation: Dr. Nicholas Curry**<sup>1</sup>, Dr. Kent VanEvery<sup>2</sup>, Mr. Johann Susnjar<sup>1</sup>, Mr. Stefan Björklund<sup>3</sup> and Todd Snyder<sup>2</sup>, <sup>1</sup>Research and Development, Treibacher Industrie AG, Althofen, Austria, <sup>2</sup>Progressive Surface, Grand Rapids, MI, <sup>3</sup>University West, Trollhattan, Sweden

### 8:20 a.m.

**Solution Precursor Plasma Spray of Yttrium Aluminum Garnet Thermal Barrier Coatings: Dr. Eric Jordan**<sup>1</sup>, Dr. Maurice Gell<sup>1</sup>, Dr. jiwen wang<sup>2</sup>, Chen Jiang<sup>1</sup>, Mr. Jeffrey roth<sup>1</sup> and Mr. Rishi kumar<sup>3</sup>, <sup>1</sup>School of Mechanical Engineering, The University of Connecticut, Storrs, CT, <sup>2</sup>Hifunda LLC, Storrs, CT, <sup>3</sup>MSE, Universtiy of Connecticut, storrs, CT

### 8:40 a.m.

**Process-Structure-Property Relationships in Advanced Thermal Barrier Coatings (TBC) Fabricated via Plasma Spray – Physical Vapor Deposition (PS-PVD): Mr. Michael P. Schmitt**<sup>1,2</sup>, Dr. Bryan J. Harder<sup>3</sup> and Dr. Douglas E. Wolfe<sup>1,2</sup>, <sup>1</sup>Materials Science and Engineering, The Pennsylvania State University, University Park, PA, <sup>2</sup>The Applied Research Laboratory, The Pennsylvania State University, University Park, PA, <sup>3</sup>Environmental Effects and Coatings (LME), NASA Glenn Research Center, Cleveland, OH

### 9:00 a.m.

**Thermal Barrier Coatings Performed by Suspension Plasma Spraying: Development and Characterization: Mr. Benjamin BERNARD**<sup>1,2</sup>, Dr. Luc BIANCHI<sup>1</sup>, Mr. André MALIE<sup>3</sup>, Dr. Vincent SCHICK<sup>2</sup> and Dr. Benjamin REMY<sup>2</sup>, <sup>1</sup>CEA DAM, Monts, France, <sup>2</sup>Laboratoire d'Energétique et de Mécanique Théorique et Appliquée (LEMTA/CNRS), Vandœuvre-lès-Nancy Cedex, France, <sup>3</sup>Safran Snecma, Châtellerault cedex, France

### 9:20 a.m.

Thermal Transport Properties of Columnar Structured Zirconia Coatings Deposited by Suspension Plasma Spraying Method: Prof. Lech Pawlowski<sup>1</sup>, Mr. Pawel Sokolowski<sup>1</sup>, Dr. Dagmar Dietrich<sup>2</sup>, Prof. Thomas Lampke<sup>3</sup> and Mr. David Jech<sup>4</sup>, <sup>1</sup>SPCTS, University of Limoges, Limoges, France, <sup>2</sup>Technical University of Chemnitz, Chemnitz, Germany, <sup>3</sup>Chemnitz University of Technology, Chemnitz, Germany, <sup>4</sup>Brno University of Technology, Brno, Czech Republic

### 9:40 a.m.

Transient High Heat Load Performance of Thick VPS W coating on Relatively Large CuCrZr Substrate: Prof. Ke-Song Zhou and Mr. Xiao-Feng Zhang, New materials institute, Guangdong General Research Institute of Industrial Technology (Guangzhou Research Institute of Non-ferrous Metals), GuangZhou, China

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

### 10:30 a.m.

**Evaluating Conditions for Manufacturing Suspension Plasma TBCs: Dr. Kent VanEvery**, Progressive Surface, Grand Rapids, MI

### 10:50 a.m.

**Axial Suspension Plasma Sprayed Thermal Barrier Coatings: Dr. Zhaolin Tang**<sup>1</sup>, G Masindo<sup>1</sup>, D Barentzen<sup>2</sup> and Z Celler<sup>1</sup>, <sup>1</sup>Northwest Mettech Corp., North Vancouver, BC, Canada, <sup>2</sup>Northwest Mettech Corp., North Vancovuer, BC, Canada

### 11:10 a.m.

Internal Stresses in Ytterbium Disilicate Multilayer Environmental Barrier Coatings With Calcium-Magnesium-Aluminosilicate Exposure: Dr. Fabian Stolzenburg<sup>1</sup>, Dr. Peter Kenesei<sup>2</sup>, Dr. Jonathan Almer<sup>2</sup>, Dr. Kang Lee<sup>3</sup> and **Prof. Katherine Faber**<sup>1</sup>, <sup>1</sup>Northwestern University, Evanston, IL, <sup>2</sup>Argonne National Laboratory, Argonne, IL, <sup>3</sup>Rolls-Royce Corporation, Indianapolis, IN

# TECHNICAL PROGRAM • MONDAY, MAY 11, 2015

### 11:30 a.m.

Preparation and Characterization of Lanthanum Zirconate by Atmospheric Plasma Spray Coatings: Mr. Sivakumar Sankaran, Mr. Praveen Kandasamy and Dr. Gurusamy Shanmugavelayutham, Bharathiar university, Coimbatore, IA, India

### 11:50 a.m.

Synthesis of Rare Earth Aluminates from Pseudoboehmite and Oxides: Mr. wilson Hernández, UMSNH, Morelia, Mexico

> 12:10 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

Testing and Characterization 1 8:00 a.m.-11:30 a.m. Meeting Room: 101B

### **Session Chairs**:

**Dr. Benjamin Peterson** Honeywell Tempe, AZ USA

Mr. Scott M. Briody Innovative Test Solutions Scotia, NY USA

### 8:00 a.m.

**On the Certification and Specification of WC-Co Type Powders: Mr. Andrew R. Nicoll**, Thermal Spray, Switzerland, Switzerland

### 8:20 a.m.

A Three Dimensional Surface Finish Measuring System that Excludes Porosity to Improve Quantification of Grounded or Lapped Thermal Spray Coated Surfaces: Mr. Harold E McCormick and Mr. Will J Pisoni, C-K Engineering, Ellisville, MO

### 8:40 a.m.

Characterizations of Plasma Sprayed CNT Reinforced Al2O3 Coatings on Boiler Tube Steels: Mr. Rakesh Goyal<sup>1</sup>, Dr. Vikas Chawla<sup>2</sup> and Dr. Buta Singh Sidhu<sup>3</sup>, <sup>1</sup>Mechanical Engineering, Chitkara University, Rajpura, India, <sup>2</sup>Mechanical Engineering, Ferozepur College of Engineering & Technology, Ferozepur, Punjab, INDIA, Ferozepur, India, <sup>3</sup>Punjab Technical University, Kapurthala, Punjab, India

### 9:00 a.m.

**Chemical Composition Influence on the FeMn-CrSi Alloy Microstructure Deposited by HVOF: Dr. Anderson Geraldo Marenda Pukasiewicz**<sup>1</sup>, Mr. Rodolpho Fernando Vaz<sup>2</sup> and Mr. Gustavo Bavaresco Sucharski<sup>3</sup>, <sup>1</sup>Mechanical Engineering, UTFPR—Ponta Grossa, Ponta Grossa, Brazil, <sup>2</sup>Mechanical Engineering, LACTEC Institute of Technology for Development, Curitiba, Brazil, <sup>3</sup>Mechanical Department, Universidade Federal do Paraná, Curitiba, Brazil

### 9:20 a.m.

**Coaxial Introductions of Resin Rods with Ceramics Nanoparticles into Gas Flame Spraying: Mr. Kazuto takai**, Osaka University, Ibaraki, Japan

### 9:40 a.m.

Comparison of Hot Corrosion Behaviors of Thermally Sprayed NiCr and Cr3C2–NiCr Coatings Exposure to Molten Vanadium Pentoxide and Sodium Sulfate: Dr. Sukhpal Singh Chatha<sup>1</sup>, Dr. Buta Singh Sidhu<sup>2</sup> and Dr. Hazoor s Sidhu<sup>1</sup>, <sup>1</sup>Yadavindra College of engineering, Punjabi University Guru Kashi Campus, Talwandi Sabo, Bathinda, India, <sup>2</sup>Punjab Technical University, Kapurthala, Punjab, India

10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

### 10:30 a.m.

**Corrosion Testing of Thermally Sprayed Aluminium: Dr. Shiladitya Paul**<sup>1</sup>, Mr. Q Y Ho<sup>2</sup>, Dr. K Yunus<sup>2</sup>, Dr. A C Fisher<sup>2</sup> and Mr. M D F Harvey<sup>3</sup>, <sup>1</sup>Materials Group, TWI, Cambridge, United Kingdom, <sup>2</sup>Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, United Kingdom, <sup>3</sup>Surface Engineering, TWI, Cambridge, United Kingdom

### 10:50 a.m.

Fe-based Powder Alloys Deposited by HVOF and HVAF for Applications Exposed to Solid Particle Erosion: Dr. Senad Dizdar<sup>1</sup> and Mr. Manish Kumar<sup>2</sup>, <sup>1</sup>Global Development, Höganäs AB, Höganäs, Sweden, <sup>2</sup>Technology & Inovation, Höganäs India Pvt. Ltd, Pune, India

### 11:10 a.m.

Hybrid Co-Cr/W-WC and Ni-W-Cr-B/W-WC Coating Systems: Mr. Luc Vernhes<sup>1,2</sup>, Dr. Marwan Azzi<sup>3</sup>, Dr. Etienne Bousser<sup>2</sup> and Dr. Jolanta E. Klemberg-Sapieha<sup>2</sup>, <sup>1</sup>Engineering, Velan, Montréal, QC, Canada, <sup>2</sup>Engineering Physics, Polytechnique Montréal, Montréal, QC, Canada, <sup>3</sup>Mechanical Engineering, Notre Dame University, Zouk Mosbeh, Lebanon

> 12:10 p.m.-1:15 p.m. • Lunch • Exhibit Halls A&B •

### Monday Plenary Session 1:30 p.m.-3:00 p.m. Exhibit Halls A&B

### 1:30 p.m.

**Dr. John Grotzinger**, Chief Scientist and Head of Strategic Planning for the Mars Rover Mission

3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

> Arc Spray 3:30 p.m.-5:10 p.m. Meeting Room: 104A

### **Session Chair:**

Dr. James Ruud General Electric Global Research Delmar, NY (US)

### 3:30 p.m.

The effect of Preheating on the Morphology of the Lamellae of Different Steel Compositions Sprayed by ASP: Mr. Rodolpho Fernando Vaz<sup>1</sup>, Dr. Anderson Geraldo Marenda Pukasiewicz<sup>2</sup>, Dr. Ramón Sigifredo Cortez Paredes<sup>3</sup> and Mr. Andre Ricardo Capra<sup>1</sup>, <sup>1</sup>Mechanical Engineering, LACTEC Institute of Technology for Development, Curitiba, Brazil, <sup>2</sup>Mechanical Engineering, UTFPR—Ponta Grossa, Ponta Grossa, Brazil, <sup>3</sup>UFPR, Curitiba, Brazil

### 3:50 p.m.

**Controlling the Twin Wire Arc Spray Process Using Artificial Neural Networks (ANN):** Dr. Karsten Hartz-Behrend<sup>1</sup>, Prof. Jochen Schein<sup>1</sup>, **Dr. Jörg Schaup**<sup>1</sup> and Dr. Jochen Zierhut<sup>2</sup>, <sup>1</sup>Lab for Plasma Technology, Universitaet der Bundeswehr Muenchen, Neubiberg, Germany, <sup>2</sup>Zierhut Messtechnik GmbH, Muenchen, Germany

### 4:10 p.m.

Influence of Gas Flow Parameters and Nozzle Design on Secondary Atomization in a Rotating Twin-Wire Arc Spray System: Mr. Jean-Baptiste Devillers<sup>1</sup>, Prof. Hanlin Liao<sup>2</sup>, Dr. Jean-Marie Malhaire<sup>3</sup> and Prof. Christian Coddet<sup>1</sup>, <sup>1</sup>IRTES—LERMPS, University of Technology Belfort—Montbéliard, SEVENANS, France, <sup>2</sup>IRTES-LERMPS, Université de Technologie de Belfort-Montbéliard, Belfort, France, <sup>3</sup>ECAM Rennes— Louis de Broglie, Rennes, France

### 4:30 p.m.

Investigation of a Pulsed Current Wire Arc Spray Process: Mr. Stefan Kirner<sup>1</sup>, Mr. Alexander Atzberger<sup>2</sup>, Dr. Stephan Zimmermann<sup>1</sup>, Prof. Jochen Schein<sup>1</sup> and Dr. Guenter Forster<sup>1</sup>, <sup>1</sup>Lab for Plasma Technology (LPT), EIT 1, Universitaet der Bundeswehr Muenchen, Neubiberg, Germany, <sup>2</sup>Universitaet der Bundeswehr Muenchen, Neubiberg, Germany 4:50 p.m.

**Evolution of Microstructure and Wear Behavior of Heat-Treated and Fused Arc-Sprayed Coatings Containing Fe<sub>2</sub>B Crystals Dispersed in Different Steel-Based Matrices: Dr. Serge Dallaire**, SYNTHE-SARC INC., Boucherville, QC, Canada

5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

Automotive and Heavy Duty Truck 3:30 p.m.-5:30 p.m. Meeting Room: 101B

> Session Chairs: Dr. Montia C. Nestler Oerlikon Metco Westbury, NY USA

Mr. Daniel Hayden Hayden Corporation Springfield, MA

### 3:30 p.m.

Application of the Thermal Spraying Technology in Pot Hardware of CGLs: Mr. lu wang and Mr. Li Qingshen, BAOSTEEL-NSC AUTOMOTIVE STEEL SHEETS Co.LTD, SHANGHAI, China

### 3:50 p.m.

Assessment of the Properties about the Thermal Sprayed Coatings for the Thermal Barrier Apllied to the Internal-Combustion Engine: Prof. KEIJI SONOYA, Masanobu Nakamura and Mr. Masashi SEKINE, Department of Mechanical System Engineering, University of Yamanashi, Kofu, Japan

### 4:10 p.m.

**Development of Protective Coatings for A390 Alloy: Dr. Ildiko Peter**<sup>1</sup>, Prof. Mario Rosso<sup>1</sup>, Christian Castella<sup>1</sup> and Dr. Avi Bendavid<sup>2</sup>, <sup>1</sup>Dep. of Applied Science and Tecnology, Politecnico di Torino, Torino, Italy, <sup>2</sup>CSIRO Manufacturing Flagship, CSIRO Manufacturing Flagship, Sydney, NSW, Australia, Sydney, Australia

### 4:30 p.m.

**Metal Matrix Composite Permanent Magnets Produced by Cold Spray: Dr. Jean-Michel Lamarre** and Dr. Fabrice Bernier, National Research Council Canada, Boucherville, QC, Canada

### 4:50 p.m.

Wear and Corrosion Resistance of Fe-based Composite TiC Particles Reinforced Coating for Application in Hydraulic Systems: Prof. Kirsten Bobzin, Mr. Mehmet Öte, Mr. Thomas Frederik Linke and Ms. Katarzyna Maria Malik, Surface Engineering Institute, RWTH Aachen University, Aachen, Germany

### 5:10 p.m. Discussion

5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

### Cold Spray Processing 3:30 p.m.-5:30 p.m. Meeting Room: 102C

### Session Chair:

**Dr. Eric Irissou** National Research Council Canada Boucherville, QC Canada

### 3:30 p.m.

Microstructure Evolution During Heat Treatment of Cold-Sprayed Ni-Ti Composite Coatings: Prof. Hamid Assadi, Department of Mechanical Engineering, Helmut Schmidt University, Hamburg, Germany

### 3:50 p.m.

High Dense Fe-Al Composites Made by Annealing of Cold-Sprayed Coatings: Dr. Evgeny Leshchinsky<sup>1</sup>, Dr. Oleksandra Bielousova<sup>2</sup> and Dr. Elena Maeva<sup>3</sup>, <sup>1</sup>Mechanical Engineering, The University of Windsor, Windsor, ON, Canada, <sup>2</sup>DIPI Laboratory, Ecole Nationale d'Ingenieurs de Saint-Etienne (ENISE), Saint-Etienne, France, <sup>3</sup>Physics, University of Windsor, Windsor, ON, Canada

### 4:10 p.m.

**Effect of Heat Treatment on the Microstructure and Properties of Cold Sprayed Ta Coating Layer: Ms. Ji-Hye Lee**<sup>1</sup>, Ms. Ji-Won Kim<sup>1</sup>, Dr. Hyung Jun Kim<sup>2</sup> and Prof. Kee-Ahn Lee<sup>1</sup>, <sup>1</sup>Department of Advanced Materials Engineering, Andong National University, Andong-si, South Korea, <sup>2</sup>RIST, Pohang, South Korea

### 4:30 p.m.

**Development of the Microstructure and Mechanical Properties of Cold-Sprayed IN718 Alloy Coating by a Novel In-Situ Shot Peening Process:** Dr. Xiao-Tao Luo, Mr. Meng-Lin Yao and **Prof. Chang-Jiu Li**, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 4:50 p.m.

Effect of Substrate Roughness on the Cratering Phenomenon in Surface Coating Using Cold Spray Process: Mr. Sébastien GOJON<sup>1</sup>, Mr. Robin KRO-MER<sup>2</sup>, Prof. Hanlin LIAO<sup>1</sup>, Dr. Christophe Verdy<sup>1</sup> and Dr. Sophie Costil<sup>2</sup>, <sup>1</sup>IRTES-LERMPS, Belfort, France, <sup>2</sup>IRTES-LERMPS institute, Belfort cedex, France

### 5:10 p.m.

Influence of Grit Blasting on the Interface Roughness and Adhesion Strength of Cold Sprayed Copper Coatings: Dr. Roman Gr. Maev<sup>1</sup>, Dr. Volf Leshchynsky<sup>1</sup>, Dr. Emil Strumban<sup>1</sup>, Dr. Dmitry Dzhurinskiy<sup>1</sup> and Dr. Elena Maeva<sup>2</sup>, <sup>1</sup>Institute for Diagnostic Imaging Research, University of Windsor, Windsor, ON, Canada, <sup>2</sup>Physics, University of Windsor, Windsor, ON, Canada

5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

> Miscellaneous 3:30 p.m.-5:30 p.m. Meeting Room: 101A

### **Session Chairs:**

Dr. Satish Dixit Plasma Technology Inc. Torrance, CA USA

> Mr. David Webb ES3 Syracuse, UT USA

### 3:30 p.m.

Investigation of Oxidation Behavior and Evolvement of Grain Morphology of Fe-Cr-Al Alloy at 1200°C and 1300°C: Ms. Yan Zhao and Prof. Yang Gao, Thermal Spraying Center of Dalian Maritime University, Dalian, China

### 3:50 p.m.

Antiadhesive, High Wear Resistance Coatings for Paper Industry: Dr. Hasso Jungklaus<sup>1</sup> and Mr. Alexander Etschmaier<sup>2</sup>, <sup>1</sup>Application, Voith Paper, Laakirchen, Austria, <sup>2</sup>R&D-TC, Voith Paper, Wimpassing, Austria

### 4:10 p.m.

**HVOF Thermally Sprayed Ni50Cr Coatings Onto Power Plant Steels: Microstructure, Porosity and Oxidation Performance: Dr. Tanvir Hussain**, Prof. D Graham McCartney, Dr. K T Voisey and Mr. Bo Song, Division of Materials, Mechanics and Structures, University of Nottingham, Nottingham, United Kingdom

### 4:30 p.m.

Influence of Metal Bond Coat Thickness on Adhesion Strength of APS Ceramic Coatings: Mr. John W. Barr, Laboratory, Watson Laboratory—Watson Grinding & MFG, Houston, TX

# **ITSC 2015**

### 4:50 p.m.

Kinetic Metallization<sup>™</sup> of High-Valued Military Components: Mr. Howard Gabel, Dr. Ralph Tapphorn and Mr. Travis Crowe, Inovati, Santa Barbara, CA

### 5:10 p.m.

Nanocomposite Boride Coating for Molten Metal Corrosion Resistance: Mr. Andrew J. Sherman, Dr. Evelina Vogli and Mr. gabriel Santillan, Mesocoat Inc., Euclid, OH

5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

Suspension & Solution Thermal Spray 3:30 p.m.-5:30 p.m. Meeting Room: 102B

### **Session Chair:**

**Dr. Luc Leblanc** *GE-Fuel Cells Schenectady, NY USA* 

### 3:30 p.m.

Effect of Feedstock Characteristics and Operating Parameters on the Properties of Cr2O3 Coatings Prepared by Suspension-HVOF Spraying: Dr. Filofteia-Laura Toma<sup>1</sup>, Mr. Stefan Scheitz<sup>2</sup>, Mr. Richard Trache<sup>3</sup>, Stefan Langner<sup>2</sup>, Prof. Christoph Leyens<sup>4</sup>, Dr. Annegret Potthoff<sup>5</sup> and Mrs. Kathrin Oelschlägel<sup>5</sup>, <sup>1</sup>Fraunhofer IWS, Dresden, Germany, <sup>2</sup>Fraunhofer Institute for Material and Beam Technology (IWS), Dresden, Germany, <sup>3</sup>IfWW, Technische Universität Dresden, Dresden, Germany, <sup>4</sup>Technische Universität Dresden, Dresden, Germany, <sup>5</sup>Fraunhofer IKTS, Dresden, Germany

### 3:50 p.m.

**HVOF Suspension Spraying of Alumina-based Coatings: Dr. Jin-Hong Kim** and Dr. Hyung Jun Kim, RIST, Pohang, South Korea

### 4:10 p.m.

The Effect of Fuel Ratio on Photoactivity of Suspension Flame Sprayed Coatings: Mr. Ben William Robinson<sup>1</sup>, Mr. A. Tabecki<sup>2</sup>, Ms. H. L. de Villiers Lovelock<sup>1</sup>, D. Jose<sup>3</sup>, Prof. A. Mills<sup>3</sup>, Prof. I. P. Parkin<sup>4</sup> and Prof. J. A. Darr<sup>4</sup>, <sup>1</sup>MCS, TWI, Cambridge, United Kingdom, <sup>2</sup>TWI ltd, Cambridge, United Kingdom, <sup>3</sup>Queen's Belfast University, Belfast, United Kingdom, <sup>4</sup>UCL, London, United Kingdom

### 4:30 p.m.

**Solution Precursor Plasma Sprayed Superhydrophobic Surface: Mr. Yuxuan Cai**, Prof. Javad Mostaghimi and Prof. Thomas W. Coyle, Centre for Advanced Coating Technologies (CACT), University of Toronto, Toronto, ON, Canada

### 4:50 p.m.

Lanthanum Zirconate Thermal Barrier Coating Fabricated by Solution Precursor Plasma Spray Process: Mr. Yuxuan Cai, Prof. Javad Mostaghimi and Prof. Thomas W. Coyle, Centre for Advanced Coating Technologies (CACT), University of Toronto, Toronto, ON, Canada

### 5:10 p.m.

Lithium Iron Phosphate Coatings Deposited by Means of Inductively-Coupled Thermal Plasma: Karine Major<sup>1</sup>, Prof. Jocelyn Veilleux<sup>2</sup> and Prof. Gessie Brisard<sup>1</sup>, <sup>1</sup>Chemistry, Université de Sherbrooke, Sherbrooke, QC, Canada, <sup>2</sup>Chemical Engineering, Université de Sherbrooke, Sherbrooke, QC, Canada

5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

> Thermal Barrier Coatings (TBCs) 3:30 p.m.-5:30 p.m. Meeting Room: 102A

### **Session Chairs:**

Dr. Rogerio S. Lima National Research Council of Canada (NRC) Boucherville, QC Canada

> Dr. Anirudha Vaidya Siemens Energy Inc. Orlando, FL (US)

### 3:30 p.m.

Improving the Corrosion Resistance of Thermal Barrier Coatings against CMAS by Depositing top ceramic layer of Enhanced Splat Bonding: Mr. Tao Liu, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li, Dr. Xiao-Tao Luo and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 3:50 p.m.

Laser Surface Texturing Pre-Treatment before Thermal Spraying—A Way to Adapt and Control the Surface Topography to the Considered Materials and the Stresses Imposed: Mr. Robin Kromer<sup>1</sup>, Dr. Sophie Costil<sup>1</sup>, Dr. Jonathan cormier<sup>2</sup>, Dr. Laurent Berthe<sup>3</sup>, Dr. Patrice peyre<sup>3</sup> and Mr. Damien courapied<sup>3</sup>, <sup>1</sup>IRTES-LERMPS institute, Belfort cedex, France, <sup>2</sup>Département de Physique et Mécanique des Matériaux, Institut P', CHASSENEUIL, France, <sup>3</sup>Laboratoire Procédés et Ingénierie en Mécanique et Matériaux, Arts&Métiers ParisTech, Paris, France

### 4:10 p.m.

Concept Optimization for Coating Application and Quality of APS applied TBC on Gas Turbine Blades and Vanes: Dr. Thomas Duda and Mr. Tobias Buecklers, Alstom (Switzerland), Birr, Switzerland

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### 4:30 p.m.

**Thermal Phase Stability of Various Plasma Sprayed TBCs: Dr. Li Li**<sup>1</sup> and Dr. Benjamin Peterson<sup>2</sup>, <sup>1</sup>Praxair Surface Technologies, Inc., Indianapolis, IN, <sup>2</sup>Honeywell Aerospace, Phoenix, AZ

### 4:50 p.m.

Novel High Sintering-Resistant Plasma-Sprayed Thermal Barrier Coatings with Designed Large Two-Dimensional Inter-Lamellar Voids: Mr. Tao Liu, Mr. Shan-Lin Zhang, Dr. Xiao-Tao Luo, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li and **Prof. Chang-Jiu Li**, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 5:10 p.m.

**Thermal Gradient Behaviour of TBCs Subjected to a Laser Gradient Test Rig: Simulating an Air-to-Air Combat Flight: Dr. Rogerio S. Lima**<sup>1</sup>, Dr. Basil R. Marple<sup>1</sup> and Mr. Pierre Marcoux<sup>2</sup>, <sup>1</sup>National Research Council of Canada (NRC), Boucherville, QC, Canada, <sup>2</sup>Vac Aero International, Boucherville, QC, Canada

> 5:30 p.m.-7:00 p.m. • Expo Welcome • Reception Exhibit Halls A&B •

# Tuesday, May 12, 2015

Cold Spray: Simulation and Particle Impact 8:00 a.m.-11:30 a.m. Meeting Room: 102B

### **Session Chair:**

**Dr. K Anand** GE Power & Water Bangalore, India

### 8:00 a.m.

A 3D Multiscale Simulation of Microscale Deposition of Cold Spray Coatings for Establishing Predictive Correlations between Atomistic Material Properties and Spray Conditions: Dr. Santanu Chaudhuri, Mr. ASM Jonayat and Ms. Maria Jaromin, University of Illinois at Urbana-Champaign, Champaign, IL

### 8:20 a.m.

A Novel Strategy for the Deposition of Diamond Based Materials with Cold Spray and Particle Speed Analysis: Mr. Morten Christian Meyer, Dr. Rocco Lupoi and Mr. Barry Aldwell, Mechanical and Manufacturing Engineering, University of Dublin, Trinity College, Dublin, Ireland

### 8:40 a.m.

Design of a Cold Spraying Nozzle to Target the Optimal Deposition Velocity of Specific Powder Materials: Prof. A. Dolmatov, H. Canales and Dr. S. Markovych, National Aerospace University, Kharkiv, Ukraine

### 9:00 a.m.

The Importance of Optimizing Nozzle Dimensions For Cold Spray Process: Dr. Renzhong Huang and Dr. Hirotaka Fukanuma, Development department, Plasma Giken Co., Ltd, Saitama, Japan

### 9:20 a.m.

**Critical Velocity Assessment of Cold Sprayed Al and Ti Alloys: Dr. Seyyed Mostafa Hassani Gangaraj**<sup>1</sup>, Atieh Moridi<sup>1</sup> and Prof. Mario Guagliano<sup>2</sup>, <sup>1</sup>Dipartimento di Ingegneria Meccanica, Politecnico di Milano, Milano, Italy, <sup>2</sup>Mechanical engineering department, Politecnico di Milano, Milano, Italy

### 9:40 a.m.

A Damage Based Finite Element Simulation of Cold Spray Coating Under Indentation Loading: Mrs. Atieh Moridi<sup>1</sup>, Dr. Seyyed Mostafa Hassani-Gangaraj<sup>1</sup> and Prof. Mario Guagliano<sup>2</sup>, <sup>1</sup>Mechanical Engineering Department, Politecnico di Milano, Milano, Italy, <sup>2</sup>Mechanical engineering department, Politecnico di Milano, Milano, Italy

> 10:00 a.m.-10:30 a.m. • Refreshment Break Exhibit Halls A&B •

### 10:30 a.m.

**Cold Spray Impact Conditions for the Deposition of High-Performance Iron-Based Metallic Glass: Dr. David E. Cipoletti**<sup>1</sup>, Dr. Constance W. Ziemian<sup>1</sup>, Dr. Wendelin J. Wright<sup>1</sup>, Dr. Dennis J. Helfritch<sup>2</sup>, Mr. Kellen V. Haile<sup>3</sup>, Ms. Maryvivian N. Okwara<sup>4</sup> and Ms. Kathleen A. Hetherington<sup>1</sup>, <sup>1</sup>Mechanical Engineering, Bucknell University, Lewisburg, PA, <sup>2</sup>U.S. Army Research Laboratory, Aberdeen Proving Ground, MD, <sup>3</sup>Bucknell University, Lewisburg, PA, <sup>4</sup>Chemical Engineering, Bucknell University, Lewisburg, PA

### 10:50 a.m.

**Deformation Behavior of Sn Particle on Different Substrates in Cold Spray: Dr. Yin Shuo**, UTBM, Belfort, France

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### 11:10 a.m.

**Comparison of Impact Crater Shape and Splat of Various Targets for Estimating Projectile Velocity: Dr. Kazunori Sakata**<sup>1</sup>, Mr. Koji Tagomori<sup>1</sup>, Mr. Naoki Sugiyama<sup>1</sup>, Mr. Daisuke Oka<sup>1</sup>, Mr. Yasuhiro Shinya<sup>1</sup>, Mr. H Sasaki<sup>2</sup>, Prof. Yasuhiro Akahoshi<sup>3</sup>, Mr. K Norimatsu<sup>4</sup>, Mr. Yosuke Fujimura<sup>3</sup>, Mr. Yuki Fukuda<sup>4</sup> and Mr. T Koura<sup>3</sup>, <sup>1</sup>Technical Engineerig Dept., Fujikikosan Corporation, Kitakyushu, Japan, <sup>2</sup>Sales Engineering Group, NAC Image Technology Inc.,, Tokyo, Japan, <sup>3</sup>Faculty of Engineering Department of Mechanical and Control Engineering, Kyushu Institute of Technology, Kitakyushu, Japan, <sup>4</sup>Mechanical and Control Engineering, Kyushu Institute of Technology, Kitakyushu, Japan

### 11:30 a.m.

Influence of Surface Oxide Film on Deposition Behaviour of Cold Spray Emulated Particle by Single Particle Shot System: Mr. Kiyohiro Ito, Dr. Yuji ICHIKAWA and Prof. Kazuhiro OGAWA, Fracture and Reliability Research Institute, Tohoku University, Sendai, Japan

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

Energy 1 8:00 a.m.-11:30 a.m. Meeting Room: 101A

### **Session Chairs**:

Dr. Xin-Hai Li Siemens Industrial Turbomachinery AB Finspong, Sweden

**Prof. Robert Vaßen** Forschungszentrum Jülich GmbH Jülich, Germany

### 8:00 a.m.

Engineered Multilayered Multimaterial Thermal barrier Coatings for Enhanced Durability and Functionality: Mr. Vaishak Viswanathan, Dr. Gopal Dwivedi and Prof. Sanjay Sampath, Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY

### 8:20 a.m.

**Self-Healing Plasma Sprayed Ceramic Coatings:** Ms. Z. Ilhan<sup>1</sup>, Mr. V. Guski<sup>2</sup>, Dr. Noriko Sata<sup>3</sup>, Dr. Aitor Hornes<sup>3</sup>, Dr. U. Weber<sup>2</sup>, Mr. Oliver Freitag<sup>3</sup>, Dr. Axel Krebs<sup>4</sup>, Dr. Günter Schiller<sup>3</sup>, Prof. S. Schmauder<sup>2</sup>, Prof. Andreas Friedrich<sup>3</sup> and **Dr. Asif Ansar**<sup>1</sup>, <sup>1</sup>Institut für Technische Thermodynamik, German Aerospace Center (DLR), Stuttgart, Germany, <sup>2</sup>Institute for Materials Testing, Materials Science and Strength of Materials (IMWF), University of Stuttgart, Stuttgart, Germany, <sup>3</sup>German Aerospace Center (DLR), Stuttgart, Germany, <sup>4</sup>University of Stuttgart, Stuttgart, Germany

### 8:40 a.m.

**M-CrAlY Bond Coats For Single And Double Layer TBCs Applied By LPPS Or HVOF:** Mr. Nelso Antolotti<sup>1</sup>, **Dr. Francesco Bozza**<sup>2</sup>, Mr. Enea Ghidini<sup>2</sup>, Mr. Luca Tagliaferri<sup>2</sup> and Dr. Martin Thoma<sup>3</sup>, <sup>1</sup>Turbocoating S.p.a., Rubbiano di Solignano (PR), Italy, <sup>2</sup>R & D, Turbocoating S.p.a., Rubbiano di Solignano (PR), Italy, <sup>3</sup>Consultant, Munich, Germany

### 9:00 a.m.

A Double Layer Thermal Barrier Concept Made of Gadolinium Zirconate and YSZ: Ms. Emine Bakan, Dr. D.E. Mack, Dr. Georg Mauer and Prof. Robert Vaßen, Institute of Energy and Climate Research (IEK-1), Forschungszentrum Jülich GmbH, Jülich, Germany

### 9:20 a.m.

ALSTOM K4-Injector-Block–Advanced HVOF-Spraying for Future Applications: Mr. Johannes Clemens Schab<sup>1</sup>, Dr. Sven Olliges<sup>1</sup>, Mr. Benjamin-Timo Zoller<sup>2</sup>, Dr. Julien René André Zimmermann<sup>1</sup>, Dr. Piero-Daniele Grasso<sup>1</sup>, Dr. Alexander Stankowski<sup>1</sup> and Prof. Christoph Leyens<sup>3</sup>, <sup>1</sup>TS-TRRR, Alstom (Switzerland) Ltd, Baden, Switzerland, <sup>2</sup>Alstom (Switzerland) Ltd, Baden, Switzerland, <sup>3</sup>Technische Universität Dresden, Dresden, Germany

### 9:40 a.m.

Modular coating for Flexible Gas Turbine Operation: Dr. Julien René André Zimmermann, Mr. Johannes Clemens Schab, Dr. Alexander Stankowski, Dr. Piero-Daniele Grasso, Dr. Sven Olliges and Prof. Christoph Leyens, TS-TRRR, Alstom (Switzerland) Ltd, Baden, Switzerland

10:00 a.m.-10:30 a.m. • Refreshment Break Exhibit Halls A&B •

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

### 10:30 a.m.

Assessment of Ni-20 Cr and WC-Co Coatings Applied by Detonation-Gun Process at 900°C: Dr. Gagandeep Kaushal<sup>1</sup>, Dr. Harpreet Singh<sup>2</sup> and Dr. satya prakash<sup>3</sup>, <sup>1</sup>Yadavindra College of Engineering, Punjabi University, Talwandi Sabo, Bathinda,, India, <sup>2</sup>School of Mechanical, Material and Energy Engineering, Indian Institute of Technology Ropar, Rupnagar, India, <sup>3</sup>Department of Metallurgical and Materials Engineering,, Indian Institute of Technology, Roorkee, India

### 10:50 a.m.

**Corrosion Protection of Boiler Components Using an Arc Sprayed Cladding Material: Mr. Leo Vinod Marcus Antony**, Alstom Power Turbomachines LLC, Chattanooga, TN

### 11:10 a.m.

**Thermally Sprayed Coatings For Supercritical Steam Power Plants: High Temperature And Fireside Corrosion Behavior:** Mr. Nelso Antolotti<sup>1</sup>, Dr. Francesco Bozza<sup>2</sup>, Mr. Enea Ghidini<sup>2</sup>, Mr. Luca Tagliaferri<sup>2</sup> and **Dr. Martin Thoma**<sup>3</sup>, <sup>1</sup>Turbocoating S.p.a., Rubbiano di Solignano (PR), Italy, <sup>2</sup>R & D, Turbocoating S.p.a., Rubbiano di Solignano (PR), Italy, <sup>3</sup>Consultant, Munich, Germany

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

Engineering, Protection and Repair of Aircraft Structural Parts 1 8:00 a.m.-11:30 a.m. Meeting Room: 102A

### **Session Chairs:**

**Mr. Arash Gabchi** Boeing South Seattle, WA USA

Mr. Thomas F. Lewis Praxair Surface Technologies Indianapolis, IN USA

### 8:00 a.m.

**Cold Spraying for Aerospace Applications: Prof. Thomas Klassen**<sup>1</sup>, Dr. Kurt Binder<sup>1</sup>, Dr. María villa<sup>1</sup>, Dr. Frank Gärtner<sup>1</sup>, Prof. Hamid Assadi<sup>1</sup> and Dr. Thomas M. Gartner<sup>2</sup>, <sup>1</sup>Department of Mechanical Engineering, Helmut Schmidt University, University of the Federal Armed Forces Hamburg, Hamburg, Germany, <sup>2</sup>Lufthansa Technik AG, Hamburg, Germany

### 8:40 a.m.

**Metallization of Polymeric Substrates by Cold Spray—Is it Possible?: Dr. Julio Villafuerte**<sup>1</sup>, Dr. Jianfeng Wang<sup>2</sup> and Dr. Harvey Ye<sup>2</sup>, <sup>1</sup>Corporate, Centerline (Windsor) Limited, Windsor, ON, Canada, <sup>2</sup>SST, Centerline (Windsor) Limited, Windsor, ON, Canada

### 9:00 a.m.

**Spall Resistant HVOF Coatings: Mr. David Webb**, R&D, ES3, Clearfield, UT

### 9:20 a.m.

**Mechanism of Calcareous Deposit formation on TSA-coated Steel Structures at Elevated Temperatures: Dr. Shiladitya Paul**<sup>1</sup>, Ms. N S Zulkfli<sup>2</sup>, Dr. K Yunus<sup>2</sup>, Dr. A C Fisher<sup>2</sup> and Mr. M D F Harvey<sup>3</sup>, <sup>1</sup>Materials Group, TWI, Cambridge, United Kingdom, <sup>2</sup>Department of Chemical Engineering and Biotechnology, University of Cambridge, Cambridge, United Kingdom, <sup>3</sup>Surface Engineering, TWI, Cambridge, United Kingdom

### 9:40 a.m.

**Improving the Adhesion of Wear-Resistant Coatings on Aerospace Polymer Composites: Ms. Axelle Elrikh**<sup>1</sup>, Dr. Simon Goutier<sup>1</sup>, Dr. Gordon Armstrong<sup>2</sup> and Prof. Armelle Vardelle<sup>1</sup>, <sup>1</sup>European Ceramic Center, University of Limoges, Limoges, France, <sup>2</sup>Materials and Surface Science Institute, University of Limerick, Limerick, Ireland

10:00 a.m.-10:30 a.m. • Refreshment Break Exhibit Halls A&B •

### 10:30 a.m.

**Coaxial Laser Assisted Cold Sprayed WC-Co Coatings: Microstructure and Mechanical Properties: Mr. Praneet Talwar**, Mr. Vikram Varadaraajan and Prof. Pravansu Mohanty, Mechanical Engineering, UNIVERSITY OF MICHIGAN DBN, Dearborn, MI

### 10:50 a.m.

**Process-Property Correlation of Heat Treated Aluminium 6061 Cold Spray Coatings: Mr. Kelvin Loke**, ST Kinetics Integrated Engineering Pte Ltd, Singapore, Singapore

### 11:10 a.m.

Effect of Friction-Stir Processing on the Wear Rate of WC-Based MMC Coatings Deposited by Low Pressure Cold Gas Dynamic Spraying: Mr. Sayed Hossein Ashrafizadeh<sup>1</sup>, Mr. Adrián Lopera-Valle<sup>1</sup>, Dr. Adrian Gerlich<sup>2</sup> and Dr. André McDonald<sup>1</sup>, <sup>1</sup>Mechanical Engineering, University of Alberta, Edmonton, AB, Canada, <sup>2</sup>Mechanical and Mechatronics Engineering, University of Waterloo, Waterloo, ON, Canada

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

Modeling & Simulation 8:00 a.m.-11:50 a.m. Meeting Room: 104A

### **Session Chair:**

**Prof. Ali Dolatabadi** Concordia University Montreal, QC Canada

### 8:00 a.m.

**Modeling of the APS Process: From the Arc to the Coating Effective Properties: Dr. Rodolphe BOLOT**<sup>1</sup>, Ms. Emilie Aubignat<sup>2</sup>, Ms. Marie-Pierre PLANCHE<sup>3</sup>, Dr. Alain Allimant<sup>4</sup>, Mr. Dominique Billières<sup>5</sup> and Prof. Ghislain montavon<sup>1</sup>, <sup>1</sup>IRTES-LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France, <sup>2</sup>IRTES-LERMPS/UTBM, Sevenans, France, <sup>3</sup>IRTES-LE-RMPS, UTBM, Sevenans, France, <sup>4</sup>Saint-Gobain C.R.E.E., Cavaillon, France, <sup>5</sup>Saint-Gobain Coating Solutions, Avignon, France

### 8:40 a.m.

**Coupled Smoothed-Particle Hydrodynamics and Phase Field Modeling of Particle Solidification in Thermal Spray: Mr. Tatu Pinomaa**<sup>1</sup>, Nana Ofori-Opoku<sup>2</sup>, Mr. Anssi Laukkanen<sup>1</sup> and Prof. Nikolas Provatas<sup>2</sup>, <sup>1</sup>VTT Technical Research Centre of Finland, Espoo, Finland, <sup>2</sup>McGill University, Montreal, QC, Canada

### 9:00 a.m.

Mesoscale Material Modeling of Virtually Generated Thermal Spray Coatings: Mr. Tatu Pinomaa<sup>1</sup>, Mr. Tom Andersson<sup>1</sup>, Nana Ofori-Opoku<sup>2</sup>, Mr. Anssi Laukkanen<sup>1</sup> and Prof. Nikolas Provatas<sup>2</sup>, <sup>1</sup>VTT Technical Research Centre of Finland, Espoo, Finland, <sup>2</sup>McGill University, Montreal, QC, Canada

### 9:20 a.m.

**Residual Stress Development During Deposition** and Cooling in Thermal Spray Coating Process: **Prof. Abul Fazal M. Arif**<sup>1</sup>, Mr. M. Usama Siddiqui<sup>1</sup> and Prof. Javad Mostaghimi<sup>2</sup>, <sup>1</sup>Mechanical Engineering, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia, <sup>2</sup>Centre for Advanced Coating Technologies (CACT), University of Toronto, Toronto, ON, Canada

### 9:40 a.m.

**Experimental Investigation and Finite Element Simulation of Residual Stress Development in Thermally Sprayed Coatings: Mr. Mohamed Elhoriny**<sup>1,2</sup>, Mr. Martin Wenzelburger<sup>1</sup>, Dr. Andreas Killinger<sup>1</sup> and Prof. Rainer Gadow<sup>1</sup>, <sup>1</sup>IMTCCC, University of Stuttgart, Stuttgart, Germany, <sup>2</sup>GSaME, University of Stuttgart, Stuttgart, Germany

> 10:00 a.m.-10:30 a.m. • Refreshment Break Exhibit Halls A&B •

### 10:30 a.m.

**Parametric Study of Plasma Torch Operation Using a MHD Model Coupling the Arc and Electrodes:** Dr. Maher Alaya, **Dr. Christophe Chazelas** and Prof. Armelle Vardelle, European Ceramic Center, University of Limoges, Limoges, France

### 10:50 a.m.

**Robot Kinematic Analysis For Torch Setup Optimization In Thermal Spraying:** Mr. Chaoyue CHEN<sup>1</sup>, Dr. Sihao DENG<sup>1</sup>, **Prof. Hanlin LIAO**<sup>2</sup> and Prof. Ghislain montavon<sup>1</sup>, <sup>1</sup>IRTES-LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France, <sup>2</sup>IRTES-LER-MPS, University of Technology Belfort—Montbéliard, Belfort, France

### 11:10 a.m.

Investigation of Flow Parameters in Wire Arc Thermal Spraying using CFD Simulation: Mr. Amirsaman Farrokhpanah<sup>1</sup>, Mr. Julien Naffrechoux<sup>2</sup>, Dr. Larry Pershin<sup>1</sup> and Prof. Javad Mostaghimi<sup>1</sup>, <sup>1</sup>Centre for Advanced Coating Technologies (CACT), University of Toronto, Toronto, ON, Canada, <sup>2</sup>Thermal and Energy Sciences, Polytech Nantes, Graduate School of Engineering, Nantes, France

### 11:30 a.m.

Taguchi Design and Analysis of 3D-Computer Fluid Dynamic (CFD) Experiments (TDACE) for the Optimization of Air-Cap Configuration in Arc Spraying: Mr. Mohamed Abdulgader<sup>1</sup>, Prof. Wolfgang Tillmann<sup>2</sup>, Mr. Nassir Anjami<sup>1</sup> and Mr. Diego Bezerra<sup>1</sup>, <sup>1</sup>Institute of Materials Engineering, Technische Universität Dortmund, Dortmund, Germany, <sup>2</sup>Institute of Materials Engineering, Technical University of Dortmund, Dortmund, Germany

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

### Novel Processes 8:00 a.m.-11:50 a.m. Meeting Room: 102C

### Session Chairs:

**Prof. Chang-Jiu Li** State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University Xi'an, China

### Dr. Majid Nabari

State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University Xi'an, China

### 8:00 a.m.

High Stability, High Enthalpy APS Process Based on Combined Wall and Gas Stabilizations of Plasma (Part 1. Process Introduction): Dr. Vladimir Belashchenko<sup>1</sup> and Dr. Alexander Zagorski<sup>2</sup>, <sup>1</sup>Thermal Spray Development Inc, Waltham, MA, <sup>2</sup>Alstom Power, Birr, Switzerland

### 8:20 a.m.

High Stability, High Enthalpy APS Process Based on Combined Wall and Gas Stabilizations of Plasma (Part 2. Coating Formation and Properties): Dr. Paolo Mor<sup>1</sup> and Dr. Vladimir Belashchenko<sup>2</sup>, <sup>1</sup>Flame Spray North America, Fountain Inn, SC, <sup>2</sup>Thermal Spray Development Inc, Waltham, MA

### 8:40 a.m.

Three-Zone Anode Geometry—The Disengagement of Classic Nozzle Design for Atmospheric Plasma Spraying: Mr. Sebastian Mihm<sup>1</sup>, Mr. Georg Thomas<sup>2</sup> and Mr. Rolf Kuhn<sup>3</sup>, <sup>1</sup>ALSTOM (Switzerland) Ltd, Baden, Switzerland, <sup>2</sup>Department of Joining and Coating Technology , IWF, Technical University of Berlin, Berlin, Germany, <sup>3</sup>Medicoat AG, Mägenwil, Switzerland

### 9:00 a.m.

Application of Mist Air Cooling Technique to Various Type Thermal Spraying Gun: Mr. Takashi Kumai<sup>1</sup>, Mr. Yusuke Nishiura<sup>1</sup>, Mr. Yasuhiro Ohmori<sup>1</sup>, Mr. Yoshio Shin<sup>2</sup> and Mr. Toshiharu Morimoto<sup>2</sup>, <sup>1</sup>Yoshikawa Kogyo, Himeji, Japan, <sup>2</sup>Nakayama Amorphous, Osaka, Japan

### 9:20 a.m.

Introducing "The eGun SystemTM" an Evolution in HVOF Technology: Mr. Terry Wilmert, Flame Spray Technologies, Inc, Grand Rapids, MI

### 9:40 a.m.

Novel Cooling and Temperature Monitoring for High Velocity Oxygen Fuel (HVOF) Coating Application: Mr. Ryan S Field, Engineering and Software System Solutions(ES3), Warner Robins, GA

### 10:00 a.m.-10:30 a.m. • Refreshment Break Exhibit Halls A&B •

### 10:30 a.m.

The Role of Nucleation and Growth in Plasma Spray-Physical Vapor Deposition: Dr. Georg Mauer, Stefan Rezanka, Dr. Andreas Hospach and Prof. Robert Vaßen, Institut für Energie- und Klimaforschung IEK-1, Forschungszentrum Jülich GmbH, Jülich, Germany

### 10:50 a.m.

**Microstructural Effects and Properties of Non-Line of Sight Coating Processing via Plasma Spray-Physical Vapor Deposition: Dr. Bryan J. Harder**<sup>1</sup>, Michael P. Schmitt<sup>2</sup> and Dr. Douglas E. Wolfe<sup>2</sup>, <sup>1</sup>Environmental Effects and Coatings (LME), NASA Glenn Research Center, Cleveland, OH, <sup>2</sup>The Pennsylvania State University, University Park, PA

### 11:10 a.m.

**Fully Nano-Equiaxed-Structured Ceramic Coating Deposited Using Plasma Spraying in the Different Pressure Environments: Prof. Yang Gao**<sup>1</sup>, Ms. Yan Zhao<sup>1</sup>, Dr. Chengqi Sun<sup>1</sup>, Mr. Jianyi Gao<sup>2</sup> and Dr. Deming Yang<sup>1</sup>, <sup>1</sup>Thermal Spraying Center of Dalian Maritime University, Dalian, China, <sup>2</sup>Arizona State University, Tempe, AZ

### 11:30 a.m.

**TixAlyN Coating Manufacturing by Reactive Very Low Pressure Plasma Spraying (R-VLPPS):** Ms. Beatrice Vautherin<sup>1</sup>, **Prof. Ghislain Montavon**<sup>1</sup>, Ms. Marie-Pierre Planche<sup>1</sup>, Dr. Aurelie Quet<sup>2</sup> and Mr. Luc Bianchi<sup>2</sup>, <sup>1</sup>IRTES-LERMPS, UTBM, Sevenans, France, <sup>2</sup>CEA Le Ripault, Monts, France

> 12:00 p.m.-1:00 p.m. • Lunch • Exhibit Halls A&B •

### Testing and Characterization 2 8:00 a.m.-9:20 a.m. Meeting Room: 101B

### **Session Chairs:**

Mr. Scott M. Briody Innovative Test Solutions Scotia, NY USA

Dr. Benjamin Peterson Honeywell Tempe, AZ USA

### 8:00 a.m.

**Porosity Measurement of YSZ Ceramic Coating Deposited with Different Parameters Deposition by Different Methods of Characterization:** Mr. João Paulo Gabre Ferreira<sup>1</sup>, Mrs. Karen Juliana Vanat<sup>2</sup>, Dr. Luciano Augusto Lourençato<sup>2</sup>, **Dr. Anderson Geraldo** 

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

Marenda Pukasiewicz<sup>1</sup>, Mr. André Ricardo Capra<sup>3</sup>, Mr. Frederico Hackbart<sup>4</sup>, Newton Reis de Moura<sup>5</sup> and Mr. Paulo Sérgio<sup>4</sup>, <sup>1</sup>Mechanical Engineering, UTFPR—Ponta Grossa, Ponta Grossa, Brazil, <sup>2</sup>Mechanical Department, Universidade Federal do Paraná, Ponta Grossa, Brazil, <sup>3</sup>LACTEC Institute of Technology for Development, Curitiba-PR, Brazil, <sup>4</sup>PETRO-BRAS, Petróleo Brasileiro S.A., Rio de Janeiro, Brazil, <sup>5</sup>PETROBRAS, Petróleo Brasileiro S.A., Rio de Janeiro

### 8:20 a.m.

Substrate Influence on Cold Gas Sprayed Titanium Coatings: Dr. María villa, N/A Felix Haeussler, Prof. H. assadi, Dr. Frank Gaertner and Prof. Thomas Klassen, Department of Mechanical Engineering, Helmut Schmidt University, University of the Federal Armed Forces Hamburg, Hamburg, Germany

### 8:40 a.m.

Thermally Sprayed Coatings as Corrosion Protection for Steel Structures-Influence of Manufacturing Processes on the Coatings Quality: Dr. Teodora Maghet<sup>1</sup>, Mr. Thomas Wilhelm<sup>1</sup>, Mr. Jörg Mährlein<sup>1</sup>, Mrs. Susanne Friedrich<sup>2</sup>, Mrs. Romy Regenspurger<sup>2</sup> and Dr. Monica Sallai<sup>1</sup>, <sup>1</sup>GSI SLV-Duisburg, Duisburg, Germany, <sup>2</sup>IKS Dresden, Dresden, Germany

> 10:00 a.m.-10:30 a.m. Refreshment Break • Exhibit Halls A&B •

> > **Biomedical 1** 10:30 a.m.-11:50 a.m. **Meeting Room: 101B**

### **Session Chairs**:

Dr. Raian Bamola Surface Modification Systems Inc. Santa Fe Springs, CA USA

Mr. Richard Vander Straten ES3 Inc. Syracuse, UT (US)

### 10:30 a.m.

**Evolving Architecture of Dental Implants for Osse**ointegration: Dr. Rajan Bamola, Surface Modification Systems Inc., Santa Fe Springs, CA

### 10:50 a.m.

Vacuum Plasma Spray (VPS) System Considerations for Plasma Spraying Titanium Coatings for Biomedical Applications: Dr. Robert Gansert, Advanced Materials & Technology Services, Inc, Simi Valley, CA

11:10 a.m. Discussion

12:00 p.m.-1:00 p.m. Lunch 
Exhibit Halls A&B

**Tuesday Plenary Session** 1:00 p.m.-3:30 p.m. **Exhibit Halls A&B** 

### 1:00 p.m.

AeroMat Plenary Presentation

1:45 p.m. **ITSC/TSS** Award Presentations

2:00 p.m. **ITSC Plenary Presentation** 

2:45 p.m. **IMS Plenary Presentation** 

> 3:30 p.m.-4:00 p.m. Refreshment Break
> Exhibit Halls A&B

> > **Cold Spray Processing 2** 4:00 p.m.-5:00 p.m. Meeting Room: 102B

> > > **Session Chair:** Dr. Eklavya Calla GE Power & Water Bangalore, India

### 4:00 p.m.

Microstructural Characterization of Cold Sprayed Copper-Tungsten Metal Matrix Composites: Dr. Aaron Hall and Dr. Pylin Sarobol, Sandia National Laboratories, Albuquerque, NM

### 4:20 p.m.

Improving Cold Sprayability: Mixed Metal Powders: Prof. Stephen Yue<sup>1</sup>, Dr. Huseyin Aydin<sup>2</sup>, Dr. Phuong Vo<sup>3</sup>, Rosaire Mongrain<sup>4</sup>, Rajib barua<sup>5</sup> and **Dr. Richard Dolbec**<sup>6</sup>, <sup>1</sup>Mining and Materials Engineering, McGill University, Montreal, QC, Canada, <sup>2</sup>Department of Mining and Materials Engineering, McGill university, Montreal, QC, Canada, <sup>3</sup>National Research Council Canada, Boucherville, Montreal, QC, Canada, <sup>4</sup>McGill University, Montreal, QC, Canada, <sup>5</sup>McGIll University, Montreal, QC, Canada, <sup>6</sup>Tekna Plasma Systems Inc, Sherbrooke, QC, Canada

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

### 4:40 p.m.

**Cold Spraying of Plastic Composites Powder: Mr. Kazuto Sato** and Mr. Junya Yamada, Thermal Spray Materials Dept., Fujimi Incorporated, Kakamigahara, Gifu Pref., Japan

### 5:00 p.m.

**Mechanistic Study and Characterization of Cold Sprayed Ultra High Molecular Weight Polyethylene-Nano Ceramic Composite Coating: Mr. KESAVAN RAVI**<sup>1</sup>, Dr. Yuji ICHIKAWA<sup>2</sup>, Prof. Kazuhiro OGAWA<sup>2</sup>, Ms. TIANA DEPLANKE<sup>3</sup>, Prof. OLIVIER LAME<sup>3</sup> and Prof. Jean-Yves CAVAILLE<sup>3</sup>, <sup>1</sup>Fracture and Reliability Research Institute, TOHOKU UNIVERSITY, SENDAI, Japan, <sup>2</sup>Fracture and Reliability Research Institute, Tohoku University, Sendai, Japan, <sup>3</sup>MATEIS, INSA LYON, LYON, France

### 5:20 p.m.

**Effect of Substrate Preparation on the Adhesion Strength of Aluminum Alloy Sprayed Using Cold Spray Process: Mr. Sébastien GOJON**<sup>1</sup>, Mr. Robin KROMER<sup>2</sup>, Prof. Hanlin LIAO<sup>1</sup>, Dr. Christophe Verdy<sup>1</sup> and Dr. Sophie Costil<sup>2</sup>, <sup>1</sup>IRTES-LERMPS, Belfort, France, <sup>2</sup>IRTES-LERMPS institute, Belfort cedex, France

7:00 p.m.-10:00 p.m. • Social Event\*• Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike• \*Ticket Required & Sold Separately

> Energy 2 4:00 p.m.-5:40 p.m. Meeting Room: 101A

### **Session Chairs:**

Mr. Liangde Xie GE Aviation, US Whippany, NJ USA

**Mr. Komal Laul** Chromalloy Orangeburg, NY

### 4:00 p.m.

Atmospheric Plasma Spraying of Self-Healing Thermal Barrier Coatings: Mrs. Denise Koch, Dr. Yoo J. Sohn and Prof. Robert Vaßen, Institut für Energie- und Klimaforschung IEK-1, Forschungszentrum Jülich GmbH, Jülich, Germany

### 4:40 p.m.

**Performance Characteristics of Strain Tolerant TBC: Dr. Purush Sahoo**, American Surface Modifications, Houston, TX

7:00 p.m.-10:00 p.m. • Social Event\* • Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike \*Ticket Required & Sold Separately

Engineering, Protection and Repair of Aircraft Structural Parts 2 4:00 p.m.-5:40 p.m. Meeting Room: 102A

> **Session Chairs:** Dr. Li Li Praxair Surface Technologies, Inc. Indianapolis, IN USA

> > Mr. Christopher Dambra Oerlikon Corporation Export, PA USA

### 4:00 p.m.

The Effect of Complex Geometrical Variations within the Spray Footprint on Thermal Barrier Coating Properties: Mr. Mitchell L. Sesso<sup>1</sup>, Prof. Christopher C. Berndt<sup>1</sup>, Dr. John Thornton<sup>2</sup> and Ms. Sun Yung Kim<sup>1</sup>, <sup>1</sup>Industrial Research Institute Swinburne (IRIS), Swinburne University of Technology, Hawthorn, VIC, Australia, <sup>2</sup>Air Vehicles Division, DSTO, Melbourne, Australia

### 4:20 p.m.

Advanced Cold Spray Development for Aerospace Aluminum Alloys: Mr. Victor K. Champagne, U.S. Army Research Laboratory, Aberdeen Proving Ground, MD

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

### 4:40 p.m.

Evaluation of Powder Properties on the Performance of Cold Sprayed Ti6Al4V for Aerospace **Repairs:** Dr. Tiziana Marrocco<sup>1</sup>, Philip McNutt<sup>1</sup>, Dr. Roger Barnett<sup>1</sup>, Dr. Simone Vezzù<sup>2</sup>, Enrico Vedelago<sup>3</sup>, Prof. Mario Guagliano<sup>4</sup>, Dr. Seyyed Mostafa Hassani-Gangaraj<sup>5</sup>, Dr. Pedro Poza<sup>6</sup>, Dr. C.J. Munez<sup>7</sup>, Miguel Angel Garrido-Maneiro<sup>6</sup>, A. Rico<sup>6</sup>, Robert Deffley<sup>8</sup>, Antonio Aragon-Ortiz<sup>9</sup> and Ms. H L de Villiers Lovelock<sup>1</sup>, <sup>1</sup>TWI ltd, Cambridge, United Kingdom, <sup>2</sup>Dipartimento di Ingegneria Meccanica, Politecnico di Milano, Milano, Italy, <sup>3</sup>Veneto Nanotech, Venezia, Marghera, Italy, <sup>4</sup>Mechanical engineering department, Politecnico di Milano, Milano, Italy, <sup>5</sup>Mechanical Engineering Department, Politecnico di Milano, Milano, Italy, <sup>6</sup>Univeridad Rey Juan Carlos, Mostoles, Spain, <sup>7</sup>Veneto Nanotech, Venice, Italy, <sup>8</sup>LPW Technology, Runcorn, United Kingdom, <sup>9</sup>Ingenieria de SPF, Airbus Military (CBC Plant), El Puerto de Santa Maria (Cadiz), Spain

### 5:00 p.m.

**Cold Spray of Al Alloys as Repair Technology in Aeronautics:** Dr. Simone Vezzù<sup>1</sup>, Enrico Vedelago<sup>1</sup>, Mr. Peter Richter Sr<sup>2</sup>, Mr. Peter Richter Jr<sup>2</sup>, **Prof. Mario Guagliano**<sup>3</sup>, Mrs. Atieh Moridi<sup>3</sup>, Dr. Pedro Poza<sup>4</sup>, Dr. C.J. Munez<sup>4</sup>, Dr. Giovanni Paolo Zanon<sup>5</sup> and Dr. Giovanni Alfeo<sup>6</sup>, <sup>1</sup>Veneto Nanotech, Venice, Italy, <sup>2</sup>Impact Innovations GmbH, Rattenkirchen, Germany, <sup>3</sup>Mechanical engineering department, Politecnico di Milano, Milano, Italy, <sup>4</sup>Univeridad Rey Juan Carlos, Mostoles, Spain, <sup>5</sup>GE Avio s.r.l., Rivalta di Torino, Italy, <sup>6</sup>GE Avio s.r.l., Brindisi, Italy

### 5:20 p.m.

The Measurement of Residual Stresses in Cold Sprayed Nickel Based Superalloys via Neutron Diffraction: Ms. Sun Yung Kim<sup>1</sup>, Dr. Vladimir Luzin<sup>2</sup>, Dr. John Thornton<sup>3</sup>, Dr. Peter King<sup>4</sup>, Dr. Darren Fraser<sup>4</sup>, Mr. Mitchell L. Sesso<sup>1</sup>, Mr. Stefan Gulizia<sup>4</sup>, Dr. Yat Choy Wong<sup>1</sup> and **Prof. Christopher C. Berndt<sup>1</sup>**, <sup>1</sup>Industrial Research Institute Swinburne (IRIS), Swinburne University of Technology, Hawthorn, VIC, Australia, <sup>2</sup>The Bragg Institute, Australian Nuclear Science and Technology Organisation, Sydney, Australia, <sup>3</sup>Air Vehicles Division, DSTO, Melbourne, Australia, <sup>4</sup>Manufacturing Flagship, CSIRO, Melbourne, Australia

7:00 p.m.-10:00 p.m. • Social Event \* • Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike • \*Ticket Required & Sold Separately

### Miscellaneous 2 4:00 p.m.-5:40 p.m. Meeting Room: 101B

### **Session Chairs:**

**Dr. Satish Dixit** Plasma Technology Inc. Torrance, CA USA

Mr. Daniel C. Hayden Hayden Corporation West Springfield, MA USA

### 4:00 p.m.

Impacts of Alternative Fuels on the Evolution and Stability of Turbine Hot-Section Materials: Mr. Daniele R. Mumm, Mr. Timothy J. Montalbano and Mr. Matthew H. Sullivan, Dept. of Chemical Engineering & Materials Science, University of California, Irvine, Irvine, CA

### 4:40 p.m.

**Navy Valve Actuator Repair Using Cold Spray: Dr. Christian A. Widener**<sup>1,2</sup>, Mr. Robert Hrabe<sup>2</sup>, Mr. Thomas Stamey<sup>3</sup>, Mr. Benjamin Hoiland<sup>4</sup>, Mr. Michael Carter<sup>1</sup> and Mr. Victor K. Champagne<sup>5</sup>, <sup>1</sup>Arbegast Materials Processing and Joining Lab, South Dakota School of Mines and Technology, Rapid City, SD, <sup>2</sup>VRC Metal Systems, Rapid City, SD, <sup>3</sup>Puget Sound Naval Shipyard, Bremerton, WA, <sup>4</sup>Mid-America Aviation / MOOG, Grand Forks, NE, <sup>5</sup>U.S. Army Research Laboratory, Aberdeen Proving Ground, MD

### 5:00 p.m.

**Surface Modification of Austenitic Thermal Spray Coatings by Low-Temperature Nitration: Mr. Thomas Lindner**<sup>1</sup>, Mr. Thomas Mehner<sup>2</sup>, Mr. Gerd Paczkowski<sup>1</sup> and Prof. Thomas Lampke<sup>3</sup>, <sup>1</sup>Institute of Materials Science and Engineering, Chemnitz University of Technology, Chemnitz, Germany, <sup>2</sup>Chemnitz University of Technology, Chemnitz, Germany, <sup>3</sup>Institute of Materials Science and Engineering (IWW), Chemnitz University of Technology, Chemnitz, Germany

### 5:20 p.m.

The Percarbonate Stripping System for Thermal Spray (TS) Coatings-A Success Story at Tinker Air Force Base (TAFB): Mr. John P. Sauer<sup>1</sup>, Mr. Justin Sneed<sup>2</sup> and Mr. Dave Fairbourn<sup>3</sup>, <sup>1</sup>Sauer Engineering, Cincinnati, OH, <sup>2</sup>Tinker Air Force Base, Oklahoma City, OK, <sup>3</sup>Aeromet Technologies, Sandy, UT

7:00 p.m.-10:00 p.m. • Social Event \* • Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike • \*Ticket Required & Sold Separately Modeling & Simulation 2 4:00 p.m.-5:20 p.m. Meeting Room: 104A

### Session Chair:

**Dr. Rodolphe BOLOT** University of Technology of Belfort-Montbéliard Belfort, France

### 4:00 p.m.

A Numerical Investigation: Air Plasma Spraying by means of a Three-Cathode Spraying Torch: Prof. Kirsten Bobzin and Mr. Mehmet Öte, Surface Engineering Institute, RWTH Aachen University, Aachen, Germany

### 4:20 p.m.

Effect of Turbulence Modulation on Three Dimensional Trajectories of Powder Particles in Plasma Spray Process: Dr. Romesh Batra<sup>1</sup>, Dr. Shen Shang<sup>1</sup> and Mr. Michael Cybulsky<sup>2</sup>, <sup>1</sup>ESM, VirginiaTech, BLACKSBURG, VA, <sup>2</sup>Materials, Rolls-Royce Corporation, Indianapolis, IN

### 4:40 p.m.

Molecular Dynamics Simulation of Nano-Scale Ceramic Particle Connection Derived by High Velocity Collision: Prof. Guan-Jun Yang, Prof. Cheng-Xin Li, Prof. Chang-Jiu Li and Guang-Rong Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 5:00 p.m.

Fast Coating Deposition Simulation for Path Planning and Iterative Net-Shape Optimization on Complex Workpieces: Mr. T. Wiederkehr<sup>1</sup>, Prof. Wolfgang Tillmann<sup>2</sup>, Mr. Leif Hagen<sup>2</sup>, Prof. H. Müller<sup>1</sup> and Mr. Daniel Hegels<sup>1</sup>, <sup>1</sup>Computer Science VII—Computer Graphics, Technische Universität Dortmund, 44227 Dortmund, Germany, <sup>2</sup>Institute of Materials Engineering, Technische Universität Dortmund, Dortmund, Germany

7:00 p.m.-10:00 p.m. • Social Event\* • Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike \*Ticket Required & Sold Separately Suspension & Solution Plasma Spray 4:00 p.m.-5:20 p.m. Meeting Room: 102C

> Session Chair: Prof. Armelle Vardelle University of Limoges Limoges, France

### 4:00 p.m.

**Droplet And Particle Dynamics In Solution Precursor Plasma Spraying: Mr. William Duarte**<sup>1</sup>, Dr. Simon Goutier<sup>2</sup>, Prof. Sylvie Rossignol<sup>2</sup>, Prof. Armelle Vardelle<sup>1</sup> and Prof. Michel vardelle<sup>1</sup>, <sup>1</sup>University of Limoges, Limoges, France, <sup>2</sup>European Ceramic Center, University of Limoges, Limoges, France

### 4:20 p.m.

Effect of Substrate Roughness and Topography on Splat Formation in Suspension Plasma Spraying: Mr. Guillaume bidron, Dr. Simon Goutier, Dr. Paule Denoirjean and Prof. Michel Vardelle, European Ceramic Center, University of Limoges, Limoges, France

### 4:40 p.m.

Modeling of The Self-assembly of Nanoparticles into Branched Solid Aggregates for a Suspension Droplet: Mr. He Zhang and Prof. Yanguang Shan, School of Energy and Power Engineering, University of Shanghai for Science and Technology, Shanghai, China

### 5:00 p.m.

**Ceramics Filler Rods Feeding for Gas Flame Torch in Thermal Nanoparticles Spraying: Dr. Soshu Kirihara**, Joining and Welding Research Institute, Osaka University, Ibaraki, Japan

7:00 p.m.-10:00 p.m. • Social Event \* • Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike • \*Ticket Required & Sold Separately

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

## Wednesday, May 13, 2015

Biomedical 2 8:00 a.m.-9:40 a.m. Meeting Room: 101B

### **Session Chair:**

**Dr. Rajan Bamola** Surface Modification Systems, Inc. Sante Fe Springs, CA

> Mr. Richard Vader Straten ES3 Inc.

> > Syracuse, UT (US)

### 8:00 a.m.

The Role of Thermal Spray In Medical Applications: Beyound Implants: Dr. Rajan Bamola, Surface Modification Systems Inc., Santa Fe Springs, CA

### 8:20 a.m.

Characterisation and In Vitro Corrosion Resistance of Plasma Sprayed Hydroxyapatite and Hydroxyapatite—Silicon Oxide Coatings on 316L SS: Dr. Gurpreet Singh<sup>1</sup>, Dr. Hazoor Singh<sup>2</sup> and Dr. Buta Singh Sidhu<sup>3</sup>, <sup>1</sup>Mechanical Engineering Department, Punjabi University Patiala, Patiala, India, <sup>2</sup>Yadavindra College of Engineering, Punjabi University,, Bathinda, Punjab, India, <sup>3</sup>Academics, Punjab Technical University, Kapurthala, Punjab, India

### 8:40 a.m.

Mechanical Properties of Carbonated Biomimetic Nanocrystalline Apatite Coatings Obtained By Cold Spray: Ms. Emmanuelle KERGOURLAY<sup>1</sup>, Dr. David GROSSIN<sup>1</sup>, Dr. Joel ALEXIS<sup>2</sup>, Dr. Sergi Dosta<sup>3</sup>, Dr. Núria Cinca<sup>4</sup>, Dr. I. G. Cano<sup>5</sup>, Prof. Jose Maria Guilemany<sup>5</sup>, Prof. Ghislaine BERTRAND<sup>1</sup> and Prof. Christian REY<sup>1</sup>, <sup>1</sup>Université de Toulouse, CIRIMAT, UMR 5085 INPT-CNRS-UPS, Toulouse, France, <sup>2</sup>Université de Toulouse, LGP, Tarbes, France, <sup>3</sup>Thermal Spray Center, Universitat de Barcelona, Barcelona, Spain, <sup>4</sup>CPT—Thermal Spray Centre, Universitat de Barcelona, Barcelona, Barbados, <sup>5</sup>Dept. de Ciència dels Materials i Enginyeria Metal·lúrgica, Thermal Spray Centre (CPT)—Universitat de Barcelona, Barcelona, Spain

### 9:00 a.m.

**Hydroxyapatite Powders for Plasma Spray Coating Of Implantable Devices: Ms. Rose Catherin**, Medical-Group, Corp. France, Vaulx-en-Velin, France

### 9:20 a.m.

**Bioactivity Glass Coatings Elaborated by Plasma Spraying from 31SiO2-11P2O5-(58-x) CaO- X MgO Powders:** Mrs. Mónica Monsalve<sup>1,2</sup>, **Mrs. Hélène Ageorges**<sup>2</sup>, Mrs. Esperanza López<sup>1</sup>, Mr. Fabio Vargas<sup>1</sup> and Mr. Francisco Bolívar<sup>1</sup>, <sup>1</sup>Universidad de Antioquia, Medellin, Colombia, <sup>2</sup>UMR CNRS 6638, Science des Procédés Céramiques et de Traitements de Surface, Limoges, France

10:00 a.m.-11:00 a.m. • Refreshment Break and Poster Session • Exhibit Halls A&B •

> Bond Coat Development for TBCs 8:00 a.m.-9:40 a.m. Meeting Room: 102B

> > **Session Chairs:**

Mr. Raymond Sinatra Rolls Royce Coporation Indianapolis, IN USA

**Prof. Robert Vaßen** Forschungszentrum Jülich GmbH Jülich, Germany

### 8:00 a.m.

**Comparison of Plasma Sprayed High Entropy Alloys with Conventional Bond Coat Materials: Dr. Andrew S.M. Ang**<sup>1</sup>, Prof. Christopher C. Berndt<sup>2</sup>, Mr. Mitchell L. Sesso<sup>2</sup>, Ms. Ameey Anupam<sup>3</sup>, Mr. Praveen Sathiyamoorthi<sup>3</sup>, Dr. Ravi Sankar Kottada<sup>3</sup> and Prof. B.S. Murty<sup>3</sup>, <sup>1</sup>Industrial Research Institute Swinburne (IRIS), Swinburne University of Technology, Hawthorn, VIC, Australia, <sup>2</sup>Industrial Research Institute of Swinburne (IRIS), Swinburne University of Technology, Melbourne, Australia, <sup>3</sup>Department of Metallurgical and Materials Engineering, Indian Institute of Technology Madras, Chennai, India

### 8:20 a.m.

Investigation of Cold Sprayed MCrAlY as a Bondcoat Candidate for Thermal Barrier Coating: Dr. Xinqing Ma<sup>1</sup> and Mr. Peter Ruggiero<sup>2</sup>, <sup>1</sup>Curtis Wright Corporation, East Windsor, CT, <sup>2</sup>Curtiss Wright Corporation, East Windsor, CT

### 8:40 a.m.

Low Pressure Coating System (LPCS) for Plasma Spraying of Aerospace Gas Turbine Engine Applications: Dr. Robert Gansert<sup>1</sup>, Mr. Ralph Herber<sup>2</sup>, Mr. Adrian Vogel<sup>2</sup> and Mr. Ludwig Guggenheim<sup>2</sup>, <sup>1</sup>Advanced Materials & Technology Services, Inc., Simi Valley, CA, <sup>2</sup>AMT AG, Dottingen, Switzerland

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

### 9:00 a.m.

Influence of Pretreatment on the Growth Behavior of TGO on MCrAlY Bond Coat Surface: Mr. Bang-Yan Zhang, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 9:20 a.m.

**Cold Sprayed CoNiCrAlY Bond Coats for Thermal Barrier Coatings Applications: Dr. Cristian V. Cojocaru** and Dr. Eric Irissou, National Research Council of Canada, Boucherville, QC, Canada

10:00 a.m.-11:00 a.m. • Refreshment Break and Poster Session • Exhibit Halls A&B •

Characterization & Testing: Mechanical Properties 8:00 a.m.-10:00 a.m. Meeting Room: 104A

### **Session Chair:**

Mr. Scott M. Briody Innovative Test Solutions Scotia, NY USA

### 8:00 a.m.

**Stress Formation within the First Layer in Plasma Sprayed Coatings: Mr. Markus Mutter**<sup>1</sup>, Dr. R. Mücke<sup>2</sup>, Dr. Georg Mauer<sup>1</sup>, Prof. Robert Vaßen<sup>1</sup>, Mr. Hyoung Chul Back<sup>3</sup> and Dr. Jens Gibmeier<sup>3</sup>, <sup>1</sup>Institute of Energy and Climate Research (IEK-1), Forschungszentrum Jülich GmbH, Jülich, Germany, <sup>2</sup>Institut für Energie- und Klimaforschung IEK-1, Forschungszentrum Jülich GmbH, Jülich, Germany, <sup>3</sup>Karlsruher Institut für Technologie, Karlsruhe, Germany

### 8:20 a.m.

Influence of Residual Stress on the Wear Resistance of Thermal Spray Coatings: Mr. Mohamed Abdulgader, Prof. Wolfgang Tillmann, Mr. Peter S. Hollingsworth, Mr. Weifeng Luo and Dr. Ursula Selvadurai, Institute of Materials Engineering, Technical University of Dortmund, Dortmund, Germany

### 8:40 a.m.

Mechanical Properties of Thermal Sprayed Substrates: Dr. Eklavya Calla, Dr. Vishwanathan venkatachalapathy, Dr. Joydeep pal and Dr. K Anand, Materials & Process Engineering, GE Power & Water, Bangalore, India

### 9:00 a.m.

**Pitfalls of Spray Coating Analyses: Dr. Frank Gaertner**, Mr. Matthias Schulze, Mrs. Camilla Schulze, Mr. Uwe Wagener, Mr. Thomas Breckwoldt, Dr. Kurt Binder, Prof. Hamid Assadi and Prof. Thomas Klassen, Department of Mechanical Engineering, Helmut Schmidt University, University of the Federal Armed Forces Hamburg, Hamburg, Germany

### 9:20 a.m.

The Shear Test in Acc. with DIN EN 15.340: Advantages, Disadvantages, Improvements and Important Directions: Mr. Sven Hartmann, obz innovation gmbh, Bad Krozingen, Germany

### 9:40 a.m.

Characterization Of High-Velocity Single Particle Impacts On Thermally Sprayed Ceramic Coatings: Mr. Jarkko Kiilakoski, Mr. Matti Lindroos, Mr. Ville Matikainen, Dr. Marian Apostol, Dr. Heli Koivuluoto and Prof. Petri Vuoristo, Department of Materials Science, Tampere University of Technology, Tampere, Finland

10:00 a.m.-11:00 a.m. • Refreshment Break and Poster Session • Exhibit Halls A&B •

### Cold Spray Processing 3 8:00 a.m.-10:00 a.m. Meeting Room: Room 102C

### **Session Chair:**

Mr. Yuk-Chiu Lau General Electric Global Research Niskayuna, NY USA

### 8:00 a.m.

**Characterization of Laser-Assisted Cold-Sprayed (LACS) Metallic Coatings: Dr. Heli Koivuluoto**<sup>1</sup>, Mr. Jyrki Latokartano<sup>2</sup>, Mr. Jorma Vihinen<sup>2</sup> and Prof. Petri Vuoristo<sup>1</sup>, <sup>1</sup>Department of Materials Science, Tampere University of Technology, Tampere, Finland, <sup>2</sup>Department of Mechanical Engineering and Industrial Systems, Tampere University of Technology, Tampere, Finland

### 8:20 a.m.

A Novel Coaxially Laser-Assisted (COLA) Cold Spray System: Dr. Chris Allen<sup>1</sup>, Ms. H L de Villiers Lovelock<sup>2</sup>, Dr. Tiziana Marrocco<sup>2</sup> and Philip McNutt<sup>2</sup>, <sup>1</sup>Lasers and Sheet Processes, TWI Ltd, Cambridge, United Kingdom, <sup>2</sup>TWI ltd, Cambridge, United Kingdom

### 8:40 a.m.

**Coaxial Laser Assisted Cold Spray Technology: Mr. Vikram Varadaraajan** and Prof. Pravansu Mohanty, Mechanical Engineering, University of Michigan, Dearborn, MI

### 9:00 a.m.

**Cold Spray Deposition on Heated Substrates: Dr. Eklavya Calla**<sup>1</sup>, Dr. K Anand<sup>1</sup>, Dr. Vishwanathan Venkatachalapathy<sup>1</sup>, Mr. Praveen R<sup>1</sup> and Ms. Vijayalakshmi SR<sup>2</sup>, <sup>1</sup>Materials & Process Engineering, GE Power & Water, Bangalore, India, <sup>2</sup>GE-Global Research Center, Bangalore, India

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

### 9:20 a.m.

Electron Microscopy and EBSD Characterization of Cold Sprayed IN625 Coatings on 4130 Steel: Dr. Dheepa Srinivasan<sup>1</sup>, Mr. Ramar Amuthan<sup>2</sup>, Mr. Yuk-Chiu Lau<sup>3</sup>, Mr. Atanu Chaudhuri<sup>4</sup>, Mr. Y Raghupathy<sup>4</sup>, Prof. Satyam Suwas<sup>4</sup> and Prof. Chandan Srivastava<sup>4</sup>, <sup>1</sup>Repair Development Center, GE Power & Water, Bangalore, India, <sup>2</sup>GE Global Research, Bangalore, India, <sup>3</sup>General Electric Global Research, Niskayuna, NY, <sup>4</sup>Materials Engineering, Indian Institute of SCience, Bangalore, India

### 9:40 a.m.

Joining of Dissimilar Materials by the Cold Spray Process: Mr. Victor Kenneth Champagne III<sup>1</sup>, Dr. Michael K. West<sup>2</sup>, Mr. Todd Curtis<sup>2</sup> and Mr. M. Reza Rokni<sup>2</sup>, <sup>1</sup>Mechanical Engineering, University of Massachusetts, Dudley, MA, <sup>2</sup>South Dakota School of Mines and Technology, Rapid City, SD

10:00 a.m.-11:00 a.m. • Refreshment Break and Poster Session • Exhibit Halls A&B •

> Energy 3 8:00 a.m.-10:00 a.m. Meeting Room: 101A

### **Session Chairs**:

**Dr. Atin Sharma** Oerlikon Metco (US) Inc. Westbury, NY USA

### 8:00 a.m.

**3-Dimensional Electrode Coatings Produced by Cold Spraying Process for Hydrogen Evolution: Ms. Maniya Aghasibeig**, Dr. Rolf Wuthrich, Prof. Christian Moreau and Prof. Ali dolatabadi, Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada

### 8:20 a.m.

A Method for Mechanical Characterization of Cold Spray Sputter Targets in PV Manufacturing: Dr. Johannes Vlcek, Dr. Kedar Hardikar and Dr. Daniel R. Juliano, MiaSolé, a company of Hanergy, Santa Clara, CA

### 8:40 a.m.

Enhancing Plasma Sprayed LSCF Cathode Performance by Infiltration Method: Ms. Ying Li, Prof. Cheng-Xin Li, Dr. Shan-Lin Zhang, Prof. Guan-Jun Yang and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

### 9:00 a.m.

**High Performance Mo**<sub>x</sub>**N Electrode Deposited By SPPS:** Mr. Yakov Gazman<sup>1</sup>, Mr. Kevin Cole<sup>1</sup>, Mr. Jean-Michel Gariepy<sup>1</sup> and **Prof. Thomas W. Coyle<sup>2</sup>**, <sup>1</sup>Material Science and Engineering, University of Toronto, Toronto, ON, Canada, <sup>2</sup>Centre for Advanced Coating Technologies (CACT), University of Toronto, Toronto, ON, Canada

### 9:20 a.m.

Plasma Spray-Physical Vapor Deposition of La1-xSrxCoyFe1-yO3-δ Oxygen Transport Membranes on Porous Metallic Supports: Controlling Stress State and Phase Composition: Dr. Diana A Marcano<sup>1</sup>, Dr. Georg Mauer<sup>1</sup>, Dr. Yoo J. Sohn<sup>1</sup>, Prof. Robert Vaßen<sup>1</sup>, Mr. Julio G. Fayos<sup>2</sup> and Dr. Jose M. Serra<sup>2</sup>, <sup>1</sup>Institut für Energie- und Klimaforschung IEK-1, Forschungszentrum Jülich GmbH, Jülich, Germany, <sup>2</sup>Universidad Politecnica, Valencia, Spain

### 9:40 a.m.

The Microstructure Stability of Atmospheric Plasma Sprayed (Mn,Co)304 Coating Under H2 and Air Environment: Dr. Ying-Zhen Hu, Prof. Cheng-Xin Li, Dr. Shan-Lin Zhang, Prof. Guan-Jun Yang, Xiao-Tao Luo and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

10:00 a.m.-11:00 a.m. • Refreshment Break and Poster Session • Exhibit Halls A&B •

Engineering, Protection and Repair of Aircraft Structural Parts 3 8:00 a.m.-10:00 a.m. Meeting Room: 102A

### **Session Chairs**:

Mr. Alan W. Burgess SprayWerx Technologies Inc. North Vancouver, BC Canada

Dr. Rogerio S. Lima National Research Council of Canada (NRC) Boucherville, QC Canada

### 8:00 a.m.

Additive Manufacturing using Kinetic Metallization™: Dr. Ralph Tapphorn, Mr. Howard Gabel and Mr. Kyle Burriesci, Inovati, Santa Barbara, CA
# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

#### 8:20 a.m.

Hierarchical Nanocomposite Coatings for Component Life Extension: Mr. Andrew J. Sherman, Dr. Evelina Vogli and Mr. gabriel Santillan, Mesocoat Inc., Euclid, OH

#### 8:40 a.m.

Manufacturing of Thick, Crack-Free Wear Protective Coatings on Complex Geometries for Gas Turbine Parts: Dr. Thomas Duda and Mr. Marcus Riedel, Alstom (Switzerland), Birr, Switzerland

#### 9:00 a.m.

The Effect of Heat Treatment on Mechanical Properties of Thermally Sprayed Sandwich Structure Beams: Mr. Saeid Salavati<sup>1</sup>, Dr. Larry Pershin<sup>2</sup>, Prof. Thomas W. Coyle<sup>1</sup> and Prof. Javad Mostaghimi<sup>1</sup>, <sup>1</sup>Centre for Advanced Coating Technologies (CACT), University of Toronto, Toronto, ON, Canada, <sup>2</sup>University of Toronto, Toronto, ON, Canada

#### 9:20 a.m.

Investigation of the Deposition Mechanism of Cold Spray onto Carbon Fibre Reinforced Polymers: Mr. Hanqing Che<sup>1</sup>, Prof. Stephen Yue<sup>2</sup> and Dr. Phuong Vo<sup>3</sup>, <sup>1</sup>Materials Engineering, McGill University, Montreal, QC, Canada, <sup>2</sup>Mining and Materials Engineering, McGill University, Montreal, QC, Canada, <sup>3</sup>National Research Council Canada, Boucherville, QC, Canada

#### 9:40 a.m.

The Phase Structure of High Purity Rare Earth Oxide Coatings Used for Anti-Plasma Erosion: Ms. Xiaojuan Ji, Mr. Yueguang Yu, Wei'ao Hou and Xianjing Ren, Beijing General Research Institute of Mingning & Metellurgy (BGRIMM), Beijing, China

10:00 a.m.-11:00 a.m. • Refreshment Break and Poster Session • Exhibit Halls A&B •

#### Surface Preparation 8:00 a.m.-9:40 a.m. Meeting Room: 104B

#### 8:00 a.m.

Surface Preparation for Ceramics Functionalization by Thermal Spraying: Mr. Stefan Scheitz<sup>1</sup>, Dr. Filofteia-Laura Toma<sup>2</sup>, Mr. Thomas Kuntze<sup>1</sup>, Mr. Sven Thiele<sup>3</sup> and Prof. Christoph Leyens<sup>4</sup>, <sup>1</sup>Fraunhofer Institute for Material and Beam Technology (IWS), Dresden, Germany, <sup>2</sup>Fraunhofer IWS, Dresden, Germany, <sup>3</sup>Fraunhofer IKTS, Dresden, Germany, <sup>4</sup>Technische Universität Dresden, Dresden, Germany

#### 8:20 a.m.

Effect of Blasting and Spraying Parameters on the Adhesion of Arc Wire Sprayed Aluminium Coatings: Dr. Shiladitya Paul<sup>1</sup>, Mr. P J Aldhous<sup>1</sup> and Mrs. H L de Villiers Lovelock<sup>2</sup>, <sup>1</sup>Materials Group, TWI, Cambridge, United Kingdom, <sup>2</sup>Surface Engineering, TWI, Cambridge, United Kingdom

#### 8:40 a.m.

The Importance of Temperature Management in Thermal Spraying and the Respective Advantages of CO2: Mr. Werner Kroemmer, R&D, Linde AG, Unterschleissheim, Germany

#### 9:00 a.m.

**Influence of Process Parameter on Grit Blasting as a Pretreatment Process for Thermal Spraying:** Prof. Kirsten Bobzin, Mr. Mehmet Öte, Mr. Thomas Frederik Linke and **Mr. Xifang Liao**, Surface Engineering Institute, RWTH Aachen University, Aachen, Germany

#### 9:20 a.m.

**Mechanisation of the Grit Blasting Process for Thermal Spray Coating Applications:** Dr. Henry Begg<sup>1</sup>, Dr. Melissa Riley<sup>1</sup> and **Ms. H L de Villiers Lovelock**<sup>2</sup>, <sup>1</sup>Surface Engineering, TWI Ltd, Cambridge, United Kingdom, <sup>2</sup>TWI ltd, Cambridge, United Kingdom

10:00 a.m.-11:00 a.m. • Refreshment Break and Poster Session • Exhibit Halls A&B •

#### Poster Session 10:00 a.m.-11:00 a.m. Meeting Room: Exhibit Halls A&B

A Comparison Of Coating Deposition Characteristics Under Different Plasma Jet Conditions: Dr. Jie Mao, Min Liu, Chang-Guang Deng, Prof. Ke-Song Zhou, Kun Yang and Ji-fu Zhang, Institute of New Materials, Guangzhou Research Institute of Non-ferrous Metals, Guangzhou, China

A Feasibility Study on Hybrid Use of Thermal Spray Coating and Ultrasonic Nanocrystal Surface Modification: Dr. Auezhan Amanov<sup>1</sup>, Mr. Jun-Hyong Kim<sup>2</sup>, Prof. Young-Sik Pyun<sup>2</sup>, Mr. Khagendra Tripathi<sup>3</sup>, Prof. Soo-Wohn Lee<sup>3</sup>, Mr. Hae-Ryong Lee<sup>4</sup> and Mr. Taehyung Kim<sup>5</sup>, <sup>1</sup>Institue for Manufacturing System Technology, Sun Moon University, Asan, South Korea, <sup>2</sup>Mechanical Engineering, Sun Moon University, Asan, South Korea, <sup>3</sup>Research Center for Eco Multi-Functional Nanomaterials Global Research Laboratory, Sun Moon University, Asan, South Korea, <sup>4</sup>Applied Plasma Business, DAWONSYS, Siheung, South Korea, <sup>5</sup>Gas Turbine Technology Service Center / Dept. of Engineering, KEPCO Plant Service & Engineering Co. Ltd., Incheon, South Korea TSC 2015

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

Analysis of FeAl Particles Thermal State in Gas Detonation Spraying: Dr. Cezary Senderowski<sup>1</sup>, Prof. Andrzej Panas<sup>2,3</sup>, Prof. Zbigniew Bojar<sup>1</sup> and N/A Bartosz Fikus<sup>2</sup>, <sup>1</sup>Department Advanced Materials and Technologies, Military University and Technology, Warsaw, Poland, <sup>2</sup>Faculty of Mechatronics and Aeronautics, Military University and Technology, Warsaw, Poland, <sup>3</sup>Airplanes and Helicopters, The Air Force Institute of Technology, Warsaw, Poland

**Bonding Phenomena Studies of Cold Sprayed Coatings at the Interfaces:** Prof. K. H. Ko, **Mr. J. O. Choi** and Dr. H. Lee, Department of Energy Systems Research, Ajou university, Suwon, South Korea

Columnar Structured YSZ Coating Formation by PS-PVD Using Conventional Plasma Spray System Assisted through Droplet Filtering: Dr. Qing-Yu Chen, Prof. Cheng-Xin Li, Prof. Chang-Jiu Li, Xiao-Tao Luo and Prof. Guan-Jun Yang, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

**Composition Effects of La2Ce2O7 Thermal Bar rier Coatings Against Calcium-Magnesium-Aluminum-Silicate (CMAS) at 1250 °C:** Dr. Li-Shuang Wang, Dr. Guang-Rong Li, **Prof. Cheng-Xin Li**, Dr. Tao Liu, Prof. Guan-Jun Yang and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

Critical Analysis Of Wear Behavior Of H-11 Die Steel Treated Under Deep Cryogenic Treatment Machined By WEDM: Mr. Sandeep Kumar Sharma and Mr. Gurpyar Singh dhaliwal, MECHANICAL ENGI-NEERING, GURU KASHI UNIVERSITY, TALWANDI SABO, India

**Development of HVOF-Sprayed Ceramic Coatings: Mr. Peter S. Hollingsworth** and Prof. Wolfgang Tillmann, Institute of Materials Engineering, Technische Universität Dortmund, Dortmund, Germany

Effect of Annealing Treatment on the Microstructure and Properties of 316L Stainless Steel Coating Deposited by Low Pressure Plasma Spray: Dr. Deming Yang, Prof. Yang Gao and Dr. Chengqi Sun, Thermal Spraying Center of Dalian Maritime University, Dalian, China

Effect of MCrAlY Bond Coat Surface Temperature on Thermal Cyclic Lifetime of Plasma-Sprayed Thermal Barrier Coatings: Mr. Hui Dong, Prof. Chang-Jiu Li, Mr. Hang Ding, Dr. Xiao-Tao Luo, Prof. Guan-Jun Yang and Prof. Cheng-Xin Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China Effects of Nanoparticles on Liquid Feedstock Behavior in High Velocity Suspension Flame Spray Process: Mr. E Gozali<sup>1,2</sup>, Dr. S Kamnis<sup>3</sup> and Prof. S Gu<sup>3</sup>, <sup>1</sup>Xi'an Jiaotong-Liverpool University, Suzhou, China, <sup>2</sup>School of Engineering, Liverpool University, Liverpool, United Kingdom, <sup>3</sup>Civil Engineering, Xi'an Jiaotong-Liverpool University, Suzhou, China

Effect of Substrate Temperature on the Coldsprayed 316L Stainless Steel Coatings: Mr. Ying-Chun xie<sup>1</sup>, Ms. Marie-Pierre PLANCHE<sup>1</sup>, Dr. Xinkun suo<sup>1</sup>, Prof. PHILIPPE herve<sup>2</sup>, Mr. Rija RAOELISON<sup>1</sup> and Prof. H. Liao<sup>1</sup>, <sup>1</sup>LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France, <sup>2</sup>Université Paris X, paris, France

Effect of TGO Thickness On Isothermal Cyclic Lifetime of Plasma-Sprayed YSZ thermal barrier coatings: Mr. Hang Ding, Mr. Hui Dong, Prof. Chang-Jiu Li and Prof. Guan-Jun Yang, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

**Examination of the Thermal Stability of Plasma-Sprayed La2Ce2O7/YSZ Composite Coating:** Dr. Ya-Xin Xu, Dr. Tao Liu and **Prof. Chang-Jiu Li**, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

**Fabrication of Ti-Al Intermetallic Compound Coatings by Cold Spraying: Dr. Hong-Tao Wang**<sup>1</sup>, Mrs. Ruo-Yu Wang<sup>2</sup>, Dr. Xiao Chen<sup>3</sup>, Xiao-Bo Bai<sup>4</sup> and Prof. Gang-Chang Ji<sup>5</sup>, <sup>1</sup>School of mechanical and material engineering, jiujiang university, jiujiang, China, <sup>2</sup>Jiujjiang University, Jiujiang, China, <sup>3</sup>School of mechanical and material engineering, Jiujiang University, Jiujiang, China, <sup>4</sup>Jiujiang University, Jiujiang, China, <sup>5</sup>School of Mechanical & Materials Engineering, Jiujiang University, Jiujiang, China

Failure Mechanism for Flexible Dye-sensitized Solar Cells Under Repeated Bending: Mr. Xue-Long He, **Prof. Guan-Jun Yang**, Prof. Cheng-Xin Li and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

High Corrosion Resistance of Electrodeposited Ni-Graphene Nanocomposite Coating: Mr. Seyed Ali Hosseini Khorasani and Dr. Sohrab Sanjabi, Tarbiat Modares University, Tehran, Iran

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# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

High Temperature Oxidation Resistance Of Surfacing/Spraying NiCr/Al Composite Coatings: Dr. Nannan ZHANG, Mr. Danyang LIN, Ms. Yue ZHANG and Prof. Deyuan LI, Department of Materials Science and Engineering, Shenyang University of Technology, Shengyang, China

**High Thermal Conductivity Plasma Sprayed AlN Coating: Dr. Mohammed shahien**<sup>1,2</sup>, Dr. Motohiro Yamada<sup>1</sup>, Prof. Masahiro Fukumoto<sup>1</sup>, Kazumi Egota<sup>3</sup> and Kenji Okamoto<sup>3</sup>, <sup>1</sup>Toyohashi University of Technology, Toyohashi, Japan, <sup>2</sup>Central Metallurgical Research and Development Institute, CMRDI, Cairo, Egypt, <sup>3</sup>Fuji Electric Co.,Ltd., Hino, Japan

**Hot Corrosion Resistant Cermet Coatings For Marine Diesel Engines:** Dr. Francesco Marra<sup>1,2</sup>, **Dr. Giovanni Pulci**<sup>1,2</sup>, Lidia Baiamonte<sup>1,2</sup>, Stefano Gazzola<sup>3</sup>, Patrizio Giovanetto<sup>3</sup>, Prof. Cecilia Bartuli<sup>1,2</sup> and Prof. Teodoro Valente<sup>1,2</sup>, <sup>1</sup>Chemical Engineering Materials Environment, Sapienza—University of Rome, Rome, Italy, <sup>2</sup>INSTM—National Interuniversity Consortium of Materials Science and Technology, Florence, Italy, <sup>3</sup>Zanzi, Ivrea, Italy

Hydroxyapatite Powders for Plasma Spray Coating of Implantable Devices: Mr. Richard Vandevelde, MedicalGroup, Corp., Vaulx en Velin, France; MedicalGroup USA, Atlanta, GA

Influence of Element Evaporation on the Composition of La2Ce2O7 Splats Deposited by Plasma Spraying: Mrs. Li-Shuang Wang, Dr. Tao Liu, Prof. Guan-Jun Yang, Prof. Chang-Jiu Li and **Prof. Cheng-**Xin Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

Influence of the Increased Atomizing Gas Pressure on Microstructure and Mechanical Properties of Arc Sprayed Coatings: Prof. Vasyl Pokhmurskii<sup>1</sup>, Dr. Hanna Pokhmurska<sup>2</sup>, Prof. Thomas Lampke<sup>3</sup>, Dr. Mykhailo Student<sup>1</sup>, Dr. Volodymyr Gvozdeckyy<sup>1</sup> and Mr. Taras Stupnytskyy<sup>1</sup>, <sup>1</sup>G.V. Karpenko Physico-Mechanical Institute of the National Academy of Sciences of Ukraine, Lviv, Ukraine, <sup>2</sup>Institute of Materials Science and Engineering, Chemnitz University of Technology, Chemnitz, Germany, <sup>3</sup>Institute of Materials Science and Engineering, Technische Universitaet Chemnitz, Chemnitz, Germany

**Investigation of Cold-Sprayed Wc-Feal Cermet Coatings Formation and Properties: Dr. Hong-Tao Wang**<sup>1</sup>, Mrs. Ruo-Yu Wang<sup>2</sup>, Dr. Xiao Chen<sup>3</sup>, Mr. Xiao-Bo Bai<sup>4</sup> and Prof. Gang-Chang Ji<sup>4</sup>, <sup>1</sup>School of mechanical and material engineering, jiujiang university, jiujiang, China, <sup>2</sup>Jiujjiang University, Jiujiang, China, <sup>3</sup>School of mechanical and material engineering, Jiujiang University, Jiujiang, China, <sup>4</sup>School of Mechanical & Materials Engineering, Jiujiang University, Jiujiang, China Investigation of Oxidation Behavior and Evolvement of Grain Morphology of Fe-Cr-Al alloy at 1200°C and 1300°C: Ms. Yan Zhao and Prof. Yang Gao, Thermal Spraying Center of Dalian Maritime University, Dalian, China

**Isothermal Oxidation Behaviour of Thermally Sprayed Nickel Foam Structure:** Dr. Yugeswaran Subramaniam, **Prof. Thomas W. Coyle,** Dr. Larry Pershin and Prof. Javad Mostaghimi, Centre for Advanced Coating Technologies (CACT), University of Toronto, Toronto, ON, Canada

**LEBM and CRYO Milling Composite Powder Production:** Mr. Marco Robotti<sup>1</sup>, **Dr. Sergi Dosta**<sup>1</sup>, Dr. I. G. Cano<sup>1</sup>, Dr. Nuria Cinca<sup>1</sup>, Dr. Amadeu concustell<sup>1</sup> and Prof. Josep M. Guilemany<sup>2</sup>, <sup>1</sup>Dept. de Ciència dels Materials i Enginyeria Metal·lúrgica, Thermal Spray Centre (CPT)—Universitat de Barcelona, Barcelona, Spain, <sup>2</sup>Thermal Spray Center, University of Barcelona, Barcelona, Spain

Manufacturing of Porous-Structured Ti6Al4v Alloy by Selective Laser Melting: surface roughness, mechanical properties and corrosion resistance: Dr. Bo Song, Dr. Shujuan Dong, Prof. Hanlin Liao and Prof. Christian Coddet, IRTES-LERMPS, Université de Technologie de Belfort-Montbéliard, Belfort, France

**Microstructure and Post-Teatment of CuGa Target by Cold Spray: Dr. Hyung Jun Kim**<sup>1</sup>, Prof. Keeahn Lee<sup>2</sup> and Mr. Dong-yong Park<sup>3</sup>, <sup>1</sup>RIST, Pohang, South Korea, <sup>2</sup>Department of Advanced Materials Engineering, Andong National University, Andong, South Korea, <sup>3</sup>Taekwang Tech., Kyungjoo, South Korea

Microstructure, Thermal Behavior and Mechanical Properties of Mo Coatings Deposited by Plasma Spraying and Dry-Ice Blasting: Dr. Shujuan Dong, Dr. Bo Song, Prof. Hanlin Liao and Prof. Christian Coddet, IRTES-LERMPS, Université de Technologie de Belfort-Montbéliard, Belfort, France

**Micro-Joints Formation during D-Gun Spraying: Prof. Waldemar Wolczynski**<sup>1</sup>, Dr. Cezary Senderowski<sup>2</sup>, Prof. Jerzy Morgiel<sup>3</sup> and Dr. Grzegorz Garzel<sup>3</sup>, <sup>1</sup>The Institute of Metallurgy and Materials Science, Polish Academy of Sciences, Krakow, Kraków, Poland, <sup>2</sup>Department Advanced Materials and Technologies, Military University and Technology, Warsaw, Poland, <sup>3</sup>Institute of Metallurgy and Materials Science, Polish Academy of Sciences, Krakow, Poland

**Microstructure and Mechanical Properties of YSZ coatings via Gas and Droplet Co-deposition by PS-PVD:** Dr. Qing-Yu Chen, **Prof. Cheng-Xin Li**, Prof. Guan-Jun Yang, Xiao-Tao Luo and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

New Improvements of Diagnostic Method PSI III (Particle Shape Imaging) for Determination of Particle Behavior: Dr. Stephan Zimmermann, Dr. Guenter Forster, Prof. Klaus Landes and Prof. Jochen Schein, Lab for Plasma Technology (LPT), EIT 1, Universitaet der Bundeswehr Muenchen, Neubiberg, Germany

**Novel Technique of Surface Preparation for Thermally Sprayed Coatings Using Modified D-gun:** Prof. Boris Khamitsev<sup>1</sup>, Dr. Lev Baldaev<sup>1</sup>, Mr. Sergey Baldaev<sup>2</sup>, **Ms. Alsu Ahmetgareeva<sup>1</sup>**, Mr. Alexander Aleksandrov<sup>1</sup>, Ms. Renata Ismagilova<sup>1</sup> and Prof. Tamara Gavrilenko<sup>3</sup>, <sup>1</sup>TSPC, Ltd., Sherbinka, Russia, <sup>2</sup>TSPC, Ltd., Moscow, Russia, <sup>3</sup>STC Detonation, Ltd., Novosibirsk, Russia

Numerical Study of the Arc Fluctuations in DC Plasma Torch: Mr. Esmaeil Safaei Ardakani<sup>1</sup> and Prof. Javad Mostaghimi<sup>2</sup>, <sup>1</sup>University of Toronto, Department of Mechanical Engineering, Toronto, ON, Canada, <sup>2</sup>Mechanical and Industrial Engineering, University of Toronto, Toronto, ON, Canada

**Optimization of Remelting Process of Piston Aluminum Alloy Through TIG: Dr. Peihu Gao**<sup>1</sup>, Prof. Jianping Li<sup>1</sup>, Mr. Yongxin Wu<sup>2</sup>, Mr. Jilin liu<sup>2</sup>, Mrs. Zhiling Yang<sup>3</sup> and Mr. Hongyan Li<sup>3</sup>, <sup>1</sup>School of Materials and Chemical Engineering, Xi'an Technological University, Xi'an, China, <sup>2</sup>PLA Representative Office in Factory No.616, Datong, China, <sup>3</sup>Foundry of North General Power Group Co., Ltd, Datong, China

**Preparation and Characterization of Super-Hydrophobicity Silica Coating by HVOF:** Dr. Jie Li, **Prof. Cheng-Xin Li**, Ms. Yu Zhang, Prof. Xi-De Pan, Prof. Guan-Jun Yang, Xiao-Tao Luo and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

**Research on Establishment of Process Parameters and Technology Working Electric Arc Thermal Spraying of Composite Materials: Dr. Antoniu Alexandru Cernaianu**, Sc COREF SRL, Bucharest, Romania

**Residual Stresses Analysis of Cold Sprayed Coatings by Numerical Simulation:** Prof. Wenya Li<sup>1</sup>, Dr. Kang Yang<sup>1</sup>, Mr. Dongdong Zhang<sup>1</sup> and **Mr. Tao Liu**<sup>2</sup>, <sup>1</sup>School of Materials Science and Engineering, Northwestern Polytechnical University, Xi'an, China, <sup>2</sup>State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

**Scuffing Resistance of HVOF Sprayed Nanostructured Carbide Coatings: Dr. Wojciech Zorawski**<sup>1</sup> and Dr. Merard Makrenek<sup>2</sup>, <sup>1</sup>The Centre for Laser Technologies of Metals, Kielce University of Technology, Kielce, Poland, <sup>2</sup>Faculty of Management and Computer Modelling, Kielce University of Technology, Kielce, Poland Shot Peening Effect on the Morphology and Roughness of HVOF coatings: Mr. Gustavo Bavaresco Sucharski<sup>1</sup>, Dr. Anderson Geraldo Marenda Pukasiewicz<sup>2</sup>, **Mr. Rodolpho Fernando Vaz**<sup>3</sup> and Dr. Ramón Sigifredo Cortez Paredes<sup>1</sup>, <sup>1</sup>Mechanical Department, Universidade Federal do Paraná, Curitiba, Brazil, <sup>2</sup>Mechanical Engineering, UTFPR—Ponta Grossa, Ponta Grossa, Brazil, <sup>3</sup>Mechanical Engineering, LACTEC Institute of Technology for Development, Curitiba, Brazil

Solution Precursor Plasma Spraying of Bismuth Titanate by Means of Inductively-Coupled Thermal Plasma: Baptiste Le Roux and Prof. Jocelyn Veilleux, Chemical Engineering, Université de Sherbrooke, Sherbrooke, QC, Canada

Substrate Template Effect on the Microstructure of Plasma-sprayed Ceramic Splats: Mr. Shu-Wei Yao, Ms. Er-Juan Yang, Prof. Chang-Jiu Li, Dr. Xiao-Tao Luo, Prof. Guan-Jun Yang and Prof. Cheng-Xin Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

Synthesis of LaAlO3 Doped with Eu through the Citrate Precursor Method Modified by Spray Dryer: Mr. Alfredo Morales-Hernández<sup>1</sup>, Dr. Juan Zarate-Medina<sup>1</sup>, Dr. Teodoro Rivera-Montalvo<sup>2</sup> and Dr. Maria Eugenia Contreras-García<sup>1</sup>, <sup>1</sup>Instituto de Investigaciones Metalúrgicas de la Universidad Michoacana de San Nicolás de Hidalgo, Edif. "U"., Morelia, Mexico, <sup>2</sup>bCentro de Investigación en Ciencia Aplicada y Tecnología Avanzada-Legaria, México D.F., Mexico

**TGO Formation and Failure Mode of TBC Systems Comprising PVD-Al Interlayers:** Mr. Ibrahim Ali, Dr. Thomas Grund, **Prof. Thomas Lampke,** Dr. Daniel Wett, Dr. Daisy Nestler and Prof. Guntram Wagner, Institute of Materials Science and Engineering, Technische Universitaet Chemnitz, Chemnitz, Germany

The Corrosion Behavior of Thermal Spray Coating on 304L Stainless Steel in a Saline Environment: Mr. Tung-Yuan YUNG, Mr. Tai-Cheng Chen, Dr. Kun-Chao Tsai, Dr. Jiunn-Yuan Huang and Dr. Charn-Ying Chen, Institute of Nuclear Energy Research, Taoyuan, Taiwan

The Influence of Spraying Parameters on Microstructure Characterization of Thermally Sprayed Abradable Coatings: Dr. Lev Baldaev<sup>1</sup>, Mr. Sergey Baldaev<sup>2</sup>, Ms. Alsu Ahmetgareeva<sup>1</sup>, Mr. Andrey Berezovsky<sup>1</sup>, Ms. Renata Ismagilova<sup>1</sup> and Mr. Anton Zhukov<sup>1</sup>, <sup>1</sup>TSPC, Ltd., Sherbinka, Russia, <sup>2</sup>TSPC, Ltd., Moscow, Russia

#### 9:40 a.m.

The Influence of Spraying Parameters on Tribological Characterization of Thermally Sprayed Antifriction Coatings for Aircraft Bearings: Ms. Renata Ismagilova<sup>1</sup>, Dr. Lev Baldaev<sup>2</sup>, Mr. Sergey Baldaev<sup>3</sup>, Ms. Alsu Ahmetgareeva<sup>2</sup> and Prof. Boris Khamitsev<sup>1</sup>, <sup>1</sup>TSPC, Ltd., Sherbinka, Russia, <sup>2</sup>TSPC Ltd., Moscow, Russia, <sup>3</sup>TSPC, Ltd., Moscow, Russia

Thermo-Mechanical Properties of Thermal Barrier Coatings with Single and Layer Structure: Mr. Qi-Zheng Cui<sup>1</sup>, Dr. Sang-Won Myoung<sup>1</sup>, Mr. Zhe Lu<sup>1</sup>, Prof. Yeon-Gil Jung<sup>1</sup> and Ungyu Paik<sup>2</sup>, <sup>1</sup>School of Materials Science and Engineering, Changwon National University, Changwon, South Korea, <sup>2</sup>Department of Energy Engineering, Hanyang University, Seoul, South Korea

Thermo-phisical Properties of Multiphase Fe-Al Intermetallic Coating with the Oxide Ceramics Created insitu During Gas Detonation Process: Dr. Cezary Senderowski<sup>1</sup>, Prof. Andrzej Jaroslaw Panas<sup>1,2,3</sup>, N/A Bartosz Fikus<sup>2</sup>, Prof. Zbigniew Bojar<sup>1</sup> and Prof. Waldemar Wolczynski<sup>4</sup>, <sup>1</sup>Department Advanced Materials and Technologies, Military University and Technology, Warsaw, Poland, <sup>2</sup>Faculty of Mechatronics and Aeronautics, Military University and Technology, Warsaw, Poland, <sup>3</sup>Aeroplanes and Helicopters, Air Force Institute of Technology, Warsaw, Poland, <sup>4</sup>The Institute of Metallurgy and Materials Science, Polish Academy of Sciences, Krakow, Kraków, Poland

**Trajectory and Precipitation of Precursor Droplets in a RF Inductively Coupled Plasma:** Ms. Zhuolin Song and **Prof. Yanguang Shan**, School of Energy and Power Engineering, University of Shanghai for Science and Technology, Shanghai, China

Wear Analysis of NiCrAl-Bentonite Thermal Sprayed Coating With The Experimental Design Method: Dr. Abdelmadjid AIT YALA, Mechanical Engineering, University of BOUIRA, BOUIRA, Algeria

Wear and Friction Analysis of Plasma Sprayed Cr3C2-NiCr Coating: Mr. jasmeet singh<sup>1</sup> and Dr. manpreet kaur<sup>2</sup>, <sup>1</sup>mechanical engineering, Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib., fatehgarh sahib, India, <sup>2</sup>baba banda singh bahadur engineering college fatehgarh sahib, fatehgarh sahib, India

#### ITSC Young Professionals Session 11:00 a.m.-12:00 p.m. Meeting Room: 104B

#### **Session Chairs:**

Dr. Sanjay Sampath Center for Thermal Spray Research State University of New York Stony Brook University, USA

**Dr. Alfredo Valarezo** Universidad San Francisco de Quito

#### 11:00 a.m.

The Effects of Post Cold Spray Heat Treatments on Microstructure & Mechanical Properties of 7075 Al Depositions: Mr. M. Reza Rokni<sup>1</sup>, Dr. Christian A. Widener<sup>1</sup>, Dr. Grant A. Crawford<sup>1</sup> and Mr. Victor K. Champagne<sup>2</sup>, <sup>1</sup>South Dakota School of Mines and Technology, Rapid City, SD, <sup>2</sup>ARL Center for Cold Spray, US Army research Laboratory, Aberdeen, MD

#### 11:05 a.m.

**Development of Innovative Iron Alloy Thermal Bar rier Coatings for Low Temperature Applications:** Prof. Kirsten Bobzin, Mr. Thomas Frederik Linke, Mr. Mehmet Öte and **Mr. Tim Königstein**, Surface Engineering Institute, RWTH Aachen University, Aachen, Germany

#### 11:10 a.m.

**Durability Strategies for Plasma Sprayed Thermal Barrier Coatings via Layered Engineering: Mr. Vaishak Viswanathan**<sup>1</sup>, Dr. Gopal Dwivedi<sup>1</sup> and Prof. Sanjay Sampath<sup>2</sup>, <sup>1</sup>Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY, <sup>2</sup>Materials Science and Engineering Department, Center for Thermal Spray Research, State University of New York at Stony Brook, Stony Brook, NY

#### 11:15 a.m.

**LECs—Light Emitting Coatings: Mr. Michael Lehmann**, Dr. Fabian Trenkle and Mr. Sven Hartmann, obz innovation gmbh, Bad Krozingen, Germany

#### 11:20 a.m.

**Modeling the Solidification Microstructure and Mechanical Response of WC-Co coatings: Mr. Tatu Pinomaa**<sup>1</sup>, Mr. Tom Andersson<sup>1</sup>, Mr. Anssi Laukkanen<sup>1</sup>, Mr. Tomi Suhonen<sup>1</sup>, Dr. Sebastian Gurevich<sup>2</sup> and Prof. Nikolas Provatas<sup>2</sup>, <sup>1</sup>VTT Technical Research Centre of Finland, Espoo, Finland, <sup>2</sup>McGill University, Montreal, QC, Canada

#### 11:25 a.m.

Correlation of In-Situ Curvature Measurement and Hole-Drilling Method for Evaluation of Stress States in Thermally Sprayed Coatings: Mr. Markus Mutter<sup>1</sup>, Dr. R. Mücke<sup>1</sup>, Dr. Georg Mauer<sup>1</sup>, Prof. Robert Vaßen<sup>1</sup>, Mr. Hyoung Chul Back<sup>2</sup> and Dr. Jens Gibmeier<sup>2</sup>, <sup>1</sup>Institut für Energie- und Klimaforschung IEK-1, Forschungszentrum Jülich GmbH, Jülich, Germany, <sup>2</sup>Institut für Angewandte Materialien IAM-WK, Karlsruher Institut für Technologie, Karlsruhe, Germany

#### 11:30 a.m.

The Impact Behavior Alteration Depending on the Process Conditions in Kinetic Spraying of Al2O3 Particles: Prof. Changhee Lee, Mr. Jaeick Kim, Mr. Gyeongjun Byun and Mr. Hyungkwon Park, Division of Materials Science and Engineering, Hanyang University, Seoul, South Korea

#### 11:35 a.m.

**Biocompatible Porous Coating by Under-Critical Cold Spray: Mrs. Atieh Moridi**<sup>1</sup>, Dr. Seyyed Mostafa Hassani-Gangaraj<sup>1,2</sup>, Prof. Hamid Assadi<sup>3</sup>, Mr. Frank Gartner<sup>3</sup>, Prof. T. Klassen<sup>3</sup> and Prof. Mario Guagliano<sup>1</sup>, <sup>1</sup>Mechanical engineering department, Politecnico di Milano, Milano, Italy, <sup>2</sup>Materials science and engineering depatment, Massachusetts Institute of Technology, Cambridge, MA, <sup>3</sup>Department of Mechanical Engineering, Helmut Schmidt University, University of the Federal Armed Forces Hamburg, Hamburg, Germany

#### 11:40 a.m.

Influence of Microstructure on Thermal Properties of Columnar Axial Suspension Plasma Sprayed Thermal Barrier Coatings: Mr. Ashish Ganvir, Production Technology, University West, Trollhattan, Sweden, Trollhattan, Sweden

#### 11:45 a.m.

**3-Dimensional Electrode Coatings Produced by Cold Spraying Process for Hydrogen Evolution: Ms. Maniya Aghasibeig**, Prof. Ali Dolatabadi, Dr. Rolf Wuthrich and Prof. Christian Moreau, Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada

#### 11:50 a.m.

**Development of High Sintering-Resistant Thermal Barrier Coating Based on the Bridging Behavior of Inter-Lamellar Pores during Thermal Exposure: Mr. Tao Liu** and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

#### 11:55 a.m.

**Pronounced Strain Relief Due to Defect Annealing in Thermal Spray Coatings: Mrs. Miryan Lorena Bejarano**<sup>1,2</sup>, Dr. Alfredo Valarezo<sup>2</sup>, Mr. Mario Calderon<sup>2</sup>, Prof. Sanjay Sampath<sup>1</sup> and Dr. Edgar Lara-Curzio<sup>3</sup>, <sup>1</sup>Materials Science and Engineering Department, Center for Thermal Spray Research, Stony Brook, NY, <sup>2</sup>Mechanical Engineering, Universidad San Francisco de Quito, Quito, Ecuador, <sup>3</sup>Materials Science & Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN, Oak Ridge, TN

# • Lunch On Own • Cold Spray & Splat Formation

1:00 p.m.-4:10 p.m. Meeting Room: 102C

**Session Chair:** 

**Dr. Dheepa Srinivasan** *GE Power & Water Bangalore, India* 

#### 1:00 p.m.

**Cold Spray Deposition of Mechanically Alloyed Nanostructured Cu-Ni-Fe Powders: Dr. Manuel H. Martin**<sup>1</sup>, Dr. Dominique Poirier<sup>2</sup>, Dr. Jean-Gabriel Legoux<sup>1</sup>, Dr. Eric Irissou<sup>3</sup>, Dr. G. Goupil<sup>4</sup>, Dr. D. Guay<sup>4</sup> and Dr. L. Roué<sup>4</sup>, <sup>1</sup>National Research Council of Canada, Boucherville, QC, Canada, <sup>2</sup>Industrial Materials Institute, National Research Council of Canada, Boucherville, QC, Canada, <sup>3</sup>National Research Council Canada, Boucherville, QC, Canada, <sup>4</sup>Institut National de la Recherche Scientifique (INRS), Varennes, QC, Canada

#### 1:20 p.m.

**Cu-MoS2 Composite Coatings Fabricated by Cold Spray and Their Tribological Performances: Ms. Yinyin Zhang**<sup>1</sup>, Dr. Sylvie V. Descartes<sup>2</sup>, Edouard Regis<sup>3</sup>, Dr. Phuong vo<sup>4</sup> and Prof. Richard R. Chromik<sup>1</sup>, <sup>1</sup>Mining and Materials Engineering, McGill University, 3610 University Street, Montreal, Canada QC H3A 0C5, Montreal, QC, Canada, <sup>2</sup>INSA de Lyon, Lyon, France, <sup>3</sup>INSA-Lyon, Lyon, France, <sup>4</sup>National Research Council Canada, Boucherville, QC, Canada

#### 1:40 p.m.

Investigation of Oblique Incidence in Cold Spraying Cu/Cu by the minimal Average Bonding Strength to Suppress Rebounding: Mr. Kai Wang, Dr. Lingyan Kong, Dr. Y.S Tao, Prof. Tiefan Li and **Prof. Tianying** Xiong, DIVISION OF SURFACE ENGINEERING, Institute of metal research, CAS, Shenyang, China

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

#### 2:00 p.m.

**Elastic Isotropy of Cold Sprayed Coatings: Dr. Jan CIZEK**<sup>1</sup>, Dr. Hanus SEINER<sup>2</sup>, Mr. Renzhong HUANG<sup>3</sup>, Dr. Michal LANDA<sup>2</sup> and Prof. Ivo DLOUHY<sup>1</sup>, <sup>1</sup>Institute of Materials Science and Engineering, Netme Centre, Brno University of Technology, Brno, Czech Republic, <sup>2</sup>Department of Ultrasonic Methods, Institute of Thermomechanics, Czech Academy of Sciences, Prague, Czech Republic, <sup>3</sup>R&D department, Plasma Giken Co., Ltd., Saitama, Japan

#### 2:20 p.m.

**Study on Cu-Ag-Zn Abradable Seal Coatings by Cold Spraying: Dr. XINYU CUI**, Institute of Metal Research, Chinese Academy of Sciences, Shenyang, China

#### 2:40 p.m.

Effect of Alloying Active Elements of Powder on Spreading Behaviour of Plasma Spray Splats: Mr. Yongang Zhang<sup>1</sup>, Prof. Margaret Hyland<sup>1</sup>, Dr. Anh Thi Tuyet Tran<sup>1</sup> and Dr. Steven Matthews<sup>2</sup>, <sup>1</sup>Department of Chemical and Materials, the University of Auckland, Auckland, New Zealand, <sup>2</sup>School of Advanced Engineering and Technology, Massey University, Auckland, New Zealand

> 3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

#### 3:30 p.m.

**Splat Formation of Copper and Copper Alloy on Ceramic Substrate in Plasma Spray Process: Dr. Anh T.T Tran**<sup>1</sup>, Prof. Margaret Hyland<sup>1</sup>, Prof. Masahiro Fukumoto<sup>2</sup> and Prof. Paul Munroe<sup>3</sup>, <sup>1</sup>Department of Chemical and Materials, the University of Auckland, Auckland, New Zealand, <sup>2</sup>Toyohashi University of Technology, Toyohashi, Japan, <sup>3</sup>School of Materials Science and Engineering, The University of New South Wales, Sydney, Australia

#### 3:50 p.m.

Understanding the Formation of Limited Inter-Lamellar Bonding in Thermal Sprayed Ceramic Coating: Mr. Shu-Wei Yao, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li, Dr. Xiao-Tao Luo and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China Complementary Process 1:00 p.m.-4:50 p.m. Meeting Room: 101B

**Session Chair:** Mr. David Wright Accuwright Industries, Inc. Gilbert, AZ USA

Mr. Richard Vander Straten ES3 Inc. Syracuse, UT (US)

#### 1:00 p.m.

**Optimizing Cavitation Resistance—An Approach By Cold Spraying Of Several Bronze Materials: Mr. Sebastian Krebs**, Dr. Frank Gärtner and Prof. Thomas Klassen, Department of Mechanical Engineering, Helmut Schmidt University, University of the Federal Armed Forces Hamburg, Hamburg, Germany

#### 1:20 p.m.

Surface Morphology Investigations of Suspension Plasma Sprayed Zirconia Coatings: Dr. Nicolaie Markocsan, Prof. Per Nylen and Mrs. laetitia keirsse, Production Engineering, University West, Trollhättan, Sweden

#### 1:40 p.m.

Wear Behaviour of Conventional and Nano-structured Thin Films of Titanium Aluminium Nitride: Prof. Jasmaninder Singh Grewal<sup>1</sup>, Dr. Buta Singh Sidhu<sup>2</sup> and Dr. satya prakash<sup>3</sup>, <sup>1</sup>Production Engineering,, Guru Nanak Dev Engineering College, Ludhiana, Punjab, India—141 006., Ludhiana, India, <sup>2</sup>Academics, Punjab Technical University, Kapurthala, Punjab, India, <sup>3</sup>Department of Metallurgical and Materials Engineering,, Indian Institute of Technology, Roorkee, India

#### 2:00 p.m.

**Tribological Behaviour of the Bare and Thermal sprayed Hot Forming Tool Steels: Dr. Manpreet Kaur** and Mr. Nipun Sharma, Mechanical, Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib, Punjab, India, Fatehgarh Sahib, India

#### 2:20 p.m.

**Cold Spray Serial Production Applications and Application Development with Focus on Cold Spraying at OBZ Innovation GMBH: Dr. Fabian Trenkle**, Ms. Johanna Schmidt, Mr. Michael Lehmann, Mr. Mateusz Cichosz, Mr. Ingo Dresel and Mr. Sven Hartmann, obz innovation gmbh, Bad Krozingen, Germany

#### 2:40 p.m.

**Comparative Study of the Erosive Wear of Thermally Sprayed Coatings Using Powder and Flexicord Feedstock Materials: Prof. Carlos R. C. Lima**<sup>1</sup>, Prof. Rodolfo Libardi<sup>1</sup>, Ms. Miguel A. R. Mojena<sup>2</sup>, Prof. Hipólito C Fals<sup>3</sup>, Ms. Claudenete V. Leal<sup>4</sup> and Mr. Flávio Camargo<sup>5</sup>, <sup>1</sup>College of Engineering, UNIMEP—Methodist University of Piracicaba, Santa Bárbara d'Oeste, Brazil, <sup>2</sup>Mchanical Engineering, Oriente University, Santiago de Cuba, Cuba, <sup>3</sup>Mechanical Engineering, Universidad de Oriente, Santiago de Cuba, Cuba, <sup>4</sup>State University of Campinas—UNICAMP, Campinas, Brazil, <sup>5</sup>OGRAMAC Surface Engineering, Santo Antônio de Posse, Brazil

#### 3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

#### 3:30 p.m.

Effects of Powder Characteristics and High Velocity Flame Spray Processes on Hardmetal Coatings: Part 1–Cr<sub>3</sub>C<sub>2</sub>-NiCr-Coatings: Mr. Richard Trache<sup>1,2</sup>, Dr. Lutz-Michael Berger<sup>3</sup>, Mr. Sven Thiele<sup>3</sup>, Dr. Filofteia-Laura Toma<sup>1</sup>, Prof. Alexander Michaelis<sup>3</sup> and Prof. Christoph Leyens<sup>4</sup>, <sup>1</sup>Fraunhofer IWS, Dresden, Germany, <sup>2</sup>IfWW, Technische Universität Dresden, Dresden, Germany, <sup>3</sup>Fraunhofer IKTS, Dresden, Germany, <sup>4</sup>Technische Universität Dresden, Dresden, Germany

#### 3:50 p.m.

Effects of Powder Characteristics and High Velocity Flame Spray Processes on Hardmetal coatings: Part 2—Cr<sub>3</sub>C<sub>2</sub>-WC-Based Coatings: Dr. Lutz-Michael Berger<sup>1</sup>, Mr. Sven Thiele<sup>1</sup>, Mr. Richard Trache<sup>2,3</sup> and Dr. Filofteia-Laura Toma<sup>3</sup>, <sup>1</sup>Fraunhofer IKTS, Dresden, Germany, <sup>2</sup>IfWW, Technische Universität Dresden, Dresden, Germany, <sup>3</sup>Fraunhofer IWS, Dresden, Germany

#### 4:10 p.m.

Novel Suspension Plasma Sprayed Superhydrophobic Coatings And Investigating Their Durability For Anti-Icing Application: Mr. Navid Sharifi, Prof. Martin Pugh, Prof. Christian Moreau and Prof. Ali Dolatabadi, Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada

#### 4:30 p.m.

**On the Formation and Properties of Thermal Sprayed Al<sub>2</sub>O<sub>3</sub> Coatings: Mr. Tomi Suhonen**<sup>1</sup>, Tommi Varis<sup>2</sup>, Mr. Jarkko Metsäjoki<sup>1</sup>, N/A Ulla Kanerva<sup>1</sup>, Ms. Minna Niittymäki<sup>3</sup> and Dr. Kari Lahti<sup>3</sup>, <sup>1</sup>Thermal Spray, VTT Technical Research Centre of Finland, Espoo, Finland, <sup>2</sup>VTT Technical Research Centre of Finland, Espoo, Finland, <sup>3</sup>Electrical Engineering, Tampere University of Technology, Tampere, Finland

#### Energy 4 1:00 p.m.-4:30 p.m. Meeting Room: 101A

#### **Session Chairs:**

**Dr. Atin Sharma** Oerlikon Metco (US) Inc. Westbury, NY USA

**Mr. Lars Östergren** *GKN Aerospace Trollhättan, Sweden* 

#### 1:00 p.m.

Solid Particle Erosion Characteristics of HVOF Cermet Coating and Multiple-carbide Hardface Overlay: Mr. Pardeep Kumar<sup>1</sup> and Dr. Buta Singh Sidhu<sup>2</sup>, <sup>1</sup>Mechanical Engineering, Yadavindra College of Engineering, Punjabi University G.K. Campus, Talwandi Sabo, Punjab, India, <sup>2</sup>Academics, Punjab Technical University, Kapurthala, Punjab, India

#### 1:20 p.m.

**Multi-scale Structured Composite Coatings by Plasma Transferred Arc for Nuclear applications: Mr. Arnaud Werry**<sup>1</sup>, Dr. Christophe Chazelas<sup>2</sup>, Dr. Alain Denoirjean<sup>1</sup>, Erick Meillot<sup>3</sup>, Dr. Stephane Valette<sup>1</sup> and Prof. Armelle Vardelle<sup>1</sup>, <sup>1</sup>UMR CNRS 6638, University of Limoges, Limoges, France, <sup>2</sup>European Ceramic Center, University of Limoges, Limoges, France, <sup>3</sup>DAM, CEA, Monts, France

#### 1:40 p.m.

**Fireside Corrosion Performance of NiCr Coatings in Simulated Coal-biomass Combustion Environment: Dr. Tanvir Hussain**<sup>1</sup>, Dr. N.J. Simms<sup>2</sup> and Prof. John R. Nicholls<sup>3</sup>, <sup>1</sup>Division of Materials, Mechanics and Structures, University of Nottingham, Nottingham, United Kingdom, <sup>2</sup>School of Applied Sciences, Cranfield University, Cranfield, United Kingdom, <sup>3</sup>Materials Department, Cranfield University, Cranfield, United Kingdom

#### 2:00 p.m.

**Microstructure and Thermoelectric Properties of Low-Pressure Plasma-Sprayed FeSi2 Coatings: Ms. XIAOHUA FENG**<sup>1</sup>, Prof. Hanlin Liao<sup>2</sup> and Ms. Marie-Pierre PLANCHE<sup>3</sup>, <sup>1</sup>IRTES-LERMPS, University of technology Belfort-Montbéliard, SEVENANS, France, <sup>2</sup>IRTES-LERMPS, Université de Technologie de Belfort-Montbéliard, Belfort, France, <sup>3</sup>IRTES-LERMPS, UTBM, Sevenans, France

#### 2:20 p.m.

Microstructure and Thermal Conductivity of Fe-Based Coatings Prepared by Wire-Arc Spraying: Dr. Haihua YAO, Dr. Zheng Zhou and Prof. Dingyong He, College of Materials Science & Engineering, Beijing University of Technology, Beijing, China

#### 2:40 p.m.

**Use of Flame-Sprayed Coatings in Anti-Icing Systems for Airfoil Structures: Mr. Adrián Lopera-Valle** and Dr. André McDonald, Mechanical Engineering, University of Alberta, Edmonton, AB, Canada

3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

#### 3:30 p.m.

**In-situ Sensors Deposited by Laser Cladding: Ms. Yanli Zhang**<sup>1</sup>, Dr. D.E. Mack<sup>1</sup>, Dr. Georg Mauer<sup>2</sup>, Prof. Robert Vaßen<sup>2</sup> and Prof. Olivier Guillon<sup>2</sup>, <sup>1</sup>Institute of Energy and Climate Research (IEK-1), Forschungszentrum Jülich GmbH, Jülich, Germany, <sup>2</sup>Institut für Energie- und Klimaforschung IEK-1, Forschungszentrum Jülich GmbH, Jülich, Germany

#### 3:50 p.m.

**Performance Evaluation of Pyramidal Fin Arrays Produced by Additive Manufacturing via Cold Spray on Wire Mesh Compact Heat Exchangers:** Mr. Yannick Cormier<sup>1</sup>, **Mr. Philippe Dupuis**<sup>1</sup>, Mr. Antoine Corbeil<sup>2</sup> and Dr. Bertrand Jodoin<sup>1</sup>, <sup>1</sup>Mechanical Engineering, University of Ottawa, Ottawa, QC, Canada, <sup>2</sup>Brayton Energy Canada, Gatineau, QC, Canada

#### 4:10 p.m.

Manufacture of High Efficiency Environmentally Friendly Ceramic Gas Turbine Engines (CGTE) Using 3-D Laser Additive Processes: Prof. Anatoly V. Sudarev<sup>1</sup>, Prof. Vladimir G. Konakov<sup>2</sup> and Mrs. Natalia G. Sudareva<sup>3</sup>, <sup>1</sup>"Research Centre" Ceramic Engines "named after A.M. Boyko", Ltd, Saint-Petersburg, Russia, <sup>2</sup>Science-tehnical center "Glass and ceramics" Company Limited, Saint-Petersburg, Russia, <sup>3</sup>FSUE CRISM, Saint-Petersburg, Russia Engineering TBCs and Abradables 1:00 p.m.-4:50 p.m. Meeting Room: 102B

#### **Session Chairs:**

Mr. Jeff Smith Material Processing Technology Norton Shores, MI USA

**Mr. Yuk-Chiu Lau** General Electric Global Research Niskayuna, NY USA

#### 1:00 p.m.

Investigation on Plasma Sprayed CoNiCrAlY-BN-Polyester Abradable Coating Consistency using In-flight Particle Diagnostics: Dr. Eric Irissou<sup>1</sup>, Prof. Christian Moreau<sup>2</sup> and Dr. Rogerio S. Lima<sup>3</sup>, <sup>1</sup>National Research Council Canada, Boucherville, QC, Canada, <sup>2</sup>Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada, <sup>3</sup>National Research Council of Canada (NRC), Boucherville, QC, Canada

#### 1:20 p.m.

Microstructure and Properties of porous Abradable Alumina Coatings flame-sprayed by Semi-molten Particles: Prof. Chang-Jiu Li, Ms. Jiao Zou, Mr. Hui-Bin Huo, Prof. Cheng-Xin Li, Prof. Guan-Jun Yang and Ms. Jian-Tao Yao, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

#### 1:40 p.m.

Influence of APS Process Parameters on Morphologies of YSZ-Polyester Abradable Coatings: Mrs. Delphine Aussavy<sup>1</sup>, Dr. Rodolphe BOLOT<sup>1</sup>, Prof. Ghislain Montavon<sup>1</sup>, Prof. François Peyraut<sup>2</sup>, Mr. Gregory Szyndelman<sup>3</sup>, Dr. Julien Gurt-Santanach<sup>4</sup> and Dr. Serge Selezneff<sup>5</sup>, <sup>1</sup>IRTES-LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France, <sup>2</sup>M3M-LER-MPS, UTBM, Belfort, France, <sup>3</sup>Oerlikon Metco, Wohlen, Switzerland, <sup>4</sup>TURBOMECA, Bordes, France, <sup>5</sup>SNECMA, Moissy-Cramayel, France

#### 2:00 p.m.

Application of FEM for the Estimation of Thermo-Mechanical Properties of Plasma Sprayed Composite Coatings: Dr. Rodolphe BOLOT<sup>1</sup>, Ms. Delphine Aussavy<sup>2</sup> and Prof. Ghislain montavon<sup>1</sup>, <sup>1</sup>IRTES-LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France, <sup>2</sup>University of Technology of Belfort-Montbéliard, Belfort, France 80

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

#### 2:20 p.m.

AFM Study of the Faceting of Ceramic Splats during Thermal Exposure for designing high sintering-resistance TBCs: Dr. Tao Liu, Dr. Xiao-Tao Luo, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

#### 2:40 p.m.

High Efficiency Deposition of the Porous Ceramic Abradable Coating using a High Energy Plasma Torch: Jianming Liu, Mr. Yueguang Yu, Beijing General Research Institute of Mingning & Metellurgy (BGRIMM), Beijing, China

> 3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

#### 3:30 p.m.

Formation of a Continuous  $\beta$ -NiAl Layer Near the Interface in a  $\gamma$ + $\beta$  MCrAlY: Dr. Kang Yuan<sup>1</sup>, **Prof. Ru** Lin Peng<sup>1</sup> and Dr. Xin-Hai Li<sup>2</sup>, <sup>1</sup>Linkoping University, Linkoping, Sweden, <sup>2</sup>Material Technology, Research & Development, Siemens Industrial Turbomachinery AB, Finspong, Sweden

#### 3:50 p.m.

High Temperature Oxidation of Cold Gas Sprayed Bond Coats for TBC Application: Prof. Carlos R. C. Lima<sup>1</sup>, Mr. V. Crespo<sup>2</sup>, Dr. I. G. Cano<sup>2</sup>, Dr. Sergi Dosta<sup>2</sup>, Ms. M.J.X. Belem<sup>1</sup> and Prof. Josep M. Guilemany<sup>2</sup>, <sup>1</sup>College of Engineering, UNIMEP—Methodist University of Piracicaba, Santa Bárbara d'Oeste, Brazil, <sup>2</sup>Dept. de Ciència dels Materials i Enginyeria Metal·lúrgica, Thermal Spray Centre (CPT)—Universitat de Barcelona, Barcelona, Spain

#### 4:10 p.m.

A Comparison of the Thermal Properties of ZrO2-Ln2O3 (Ln – Y, La, Nd, Sm, Gd) Thermal Barrier Coatings: Mr. Ivan Mazilin<sup>1</sup>, Dr. Lev Baldaev<sup>2</sup> and Prof. Dmitri Drobot<sup>3</sup>, <sup>1</sup>TSPC Ltd., Moscow, Russia, <sup>2</sup>TSPC, Ltd., Moscow, Russia, <sup>3</sup>Lomonosov Moscow University of Fine Chemical Technology, Moscow, Russia

#### 4:30 p.m.

Hybrid HVOF and High Power Plasma Spray Gun Coating Advancements for Aero and Land Based Gas Turbine Engine Applications: Mr. Ludwig Guggenheim<sup>1</sup>, Mr. Ralph Herber<sup>1</sup>, Mr. Adrian Vogel<sup>1</sup> and Dr. Robert Gansert<sup>2</sup>, <sup>1</sup>AMT AG, Dottingen, Switzerland, <sup>2</sup>Advanced Materials & Technology Services, Inc., Simi Valley, CA

#### Engineering, Protection and Repair of Aircraft

Structural Parts 4 1:00 p.m.-4:50 p.m. Meeting Room: 102A

#### **Session Chairs**:

**Dr. Julio Villafuerte** Centerline (Windsor) Limited Windsor, ON Canada

Dr. Rogerio S. Lima National Research Council of Canada (NRC) Bouchervill, QC Canada

#### 1:00 p.m.

**Development of a Two-Stage Hybrid Technology For Repairing Turbine Blades: Dr. Martin Nicolaus**, Dr. Kai Möhwald and Prof. Hans J. Maier, Institute of Materials Science, Leibniz University of Hannover, Garbsen, Germany

#### 1:20 p.m.

Thermal Exposure Testing of a Multilayer Oxidation Protection System for Gamma-TiAl: Prof. Kirsten Bobzin, Mr. Mehmet Öte and Mr. Thomas Frederik Linke, Surface Engineering Institute, RWTH Aachen University, Aachen, Germany

#### 1:40 p.m.

HVOF and HVAF Coatings of Nano-Agglomerated Tungsten Carbide—Cobalt Powders for Water Droplet Erosion Application: Dr. Fariba Tarasi<sup>1</sup>, Mr. Mohammad- Sadegh mahdipoor<sup>1</sup>, Prof. Ali Dolatabadi<sup>2</sup>, Prof. Mamoun medraj<sup>2</sup> and **Prof. Christian** Moreau<sup>2</sup>, <sup>1</sup>MIE, Concordia University, Montréal, QC, Canada, <sup>2</sup>Mechanical and Industrial Engineering, Concordia University, Montreal, QC, Canada

#### 2:00 p.m.

Wear Characteristics of Mixed Lubricious Oxide Coatings: Dr. Satish Dixit<sup>1</sup>, Dr. Osman Levent Eryilmaz<sup>2</sup> and Dr. Ali Erdemir<sup>2</sup>, <sup>1</sup>Plasma Technology Inc., Torrance, CA, <sup>2</sup>Argonne National Lab, Chicago, CA

#### 2:20 p.m.

In-Situ Observation of Laves Phase Precipitation and Oxidation of HVOF Deposited Tribaloy<sup>™</sup> T-800 (CoMoCrSi alloy) Coatings: Mr. Andrew Vackel<sup>1</sup>, Mr. David Lee<sup>2</sup> and Prof. Sanjay Sampath<sup>3</sup>, <sup>1</sup>Materials Science and Engineering, Stony Brook University, Center for Thermal Spray Research, Stony Brook, NY, <sup>2</sup>Kennametal Stellite, Goshen, IN, <sup>3</sup>Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY

#### 2:40 p.m.

Kinetic Metallization<sup>™</sup> of Tungsten Carbide Wear Resistant Coatings: Dr. Ralph Tapphorn, Mr. Howard Gabel and Mr. Travis Crowe, Inovati, Santa Barbara, CA

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

#### 3:00 p.m.-3:30 p.m.

Refreshment Break 
Exhibit Halls A&B

#### 3:30 p.m.

**Non Line of Sight Chrome Alternatives for High Strength Steel Substrates: Mr. David Webb**, R&D, ES3, Clearfield, UT

#### 3:50 p.m.

Low Hydrogen Embrittlement (LHE) Alkaline Zinc Nickel (Zn-Ni) Plating: Mr. Craig Pessetto, R&D, ES3, Clearfield, UT

#### 4:10 p.m.

Dimensional Restoration of High-Valued Military Components Using Kinetic Metallization<sup>™</sup>: Dr. Ralph Tapphorn, Mr. Howard Gabel and Mr. Travis Crowe, Inovati, Santa Barbara, CA

#### 4:30 p.m.

**Eliminating Hexavalent Cr Emissions in Thermal Spray Alloys: Dr. Justin Cheney**, SCOPERTA, INC., San Diego, CA

> TBCs and Electrical Properties 1:00 p.m.-4:50 p.m. Meeting Room: 104A

#### Session Chair:

Mr. Pawel Sokolowski

#### 1:00 p.m.

Failure Behavior of Thermal Barrier Coatings (TBC) Under Thermomechanical Fatigue: Prof. Ahmed Ibrahim<sup>1</sup> and Prof. Christopher C. Berndt<sup>2</sup>, <sup>1</sup>Mechanical Engineering, Farmingdale State College, Farmingdale, NY, <sup>2</sup>Industrial Research Institute Swinburne (IRIS), Swinburne University of Technology, Hawthorn, Australia

#### 1:20 p.m.

Fatigue Performance of TBCs on Hastelloy-X Substrate During Cyclic Bending: Dr. Radek Musalek<sup>1</sup>, Dr. Ondrej Kovarik<sup>2</sup>, Mr. Libor Tomek<sup>2</sup>, Mr. Jan Medricky<sup>1,2</sup>, Dr. Nicholas Curry<sup>3,4</sup> and Mr. Stefan Bjorklund<sup>3</sup>, <sup>1</sup>Department of Materials Engineering, Institute of Plasma Physics AS CR, v.v.i., Prague, Czech Republic, <sup>2</sup>Department of Materials, Czech Technical University, Faculty of Nuclear Sciences and Physical Engineering, Prague 2, Czech Republic, <sup>3</sup>Production Technology, University West, Trollhattan, Sweden, Trollhattan, Sweden, <sup>4</sup>Research and Development, Treibacher Industrie AG, Althofen, Austria

#### 1:40 p.m.

Fatigue Crack Growth in Bodies with Thermally Sprayed Coatings: Dr. Ondrej Kovarik<sup>1</sup>, Dr. Radek Musalek<sup>2</sup>, Mr. Jan Medricky<sup>3</sup>, Dr. Nicholas Curry<sup>4</sup>, Mr. Stefan Bjorklund⁵, Mr. Libor Tomek<sup>6</sup> and Dr. Jan Siegl<sup>7</sup>, <sup>1</sup>Department of Materials, Czech Technical University, Faculty of Nuclear Sciences and Physical Engineering, Prague 2, Czech Republic, <sup>2</sup>Department of Materials Engineering, Institute of Plasma Physics AS CR, Prague, Czech Republic, <sup>3</sup>Czech Technical University, Faculty of Nuclear Sciences and Physical Engineering, Prague 2, Czech Republic, <sup>4</sup>Production Technology, University West, Trollhattan, Sweden, Trollhattan, Sweden, <sup>5</sup>University West, Trollhattan, Sweden, Trollhattan, Sweden, <sup>6</sup>Institute of Plasma Physics AS CR, Prague, Czech Republic, <sup>7</sup>Department of Materials, Czech Technical University, Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic

#### 2:00 p.m.

Influence of Near-Interface Cracks on the Stress Around the TGO in the Thermal Barrier Coatings During Thermal Shock: A Numerical Simulation Study: Dr. Liang WANG, Shanghai Institute of Ceramics, Chinese Academic of Sciences, Shanghai, China

#### 2:20 p.m.

**Fracture Behavior and Lifetime Performance of Thermal Barrier Coatings in Thermally Graded Mechanical Fatigue Environments:** Prof. Yeon-Gil Jung<sup>1</sup>, Ungyu Paik<sup>2</sup>, Jing Zhang<sup>3</sup>, **Mr. Zhe Lu**<sup>1</sup> and Dr. Sang-Won Myoung<sup>1</sup>, <sup>1</sup>School of Materials Science and Engineering, Changwon National Unviersity, Changwon, South Korea, <sup>2</sup>Department of Energy Engineering, Hanyang University, Seoul, South Korea, <sup>3</sup>Department of Mechanical Engineering, Indiana University – Purdue University Indianapolis, Indianapolis, IN

#### 2:40 p.m.

Epitaxial Grain Growth during 8YSZ Splat Formation on Polycrystalline YSZ Substrates by Plasma Spraying: Ms. Er-Juan Yang, Dr. Xiao-Tao Luo, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

> 3:00 p.m.-3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

#### 3:30 p.m.

**Electrical Characterization of Thermally Sprayed Insulating Ceramic Coatings: Dr. Kari Lahti**<sup>1</sup>, Ms. Minna Niittymäki<sup>1</sup>, Mr. Tomi Suhonen<sup>2</sup> and Mr. Jarkko Metsäjoki<sup>2</sup>, <sup>1</sup>Electrical Engineering, Tampere University of Technology, Tampere, Finland, <sup>2</sup>Thermal Spray, VTT Technical Research Centre of Finland, Espoo, Finland **ISC 2015** 

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# TECHNICAL PROGRAM • THURSDAY, MAY 14, 2015

#### 3:50 p.m.

Investigation of Atmospheric Plasma Sprayed Forsterite (Mg2SiO4) Coatings for High-Temperature Electrical Insulation Applications: Dr. Atin Sharma<sup>1</sup>, Ms. Nadine Heiden<sup>2</sup>, Dr. Johannes Rauch<sup>3</sup>, Mr. Jonathan Gutleber<sup>1</sup> and Dr. Montia Nestler<sup>1</sup>, <sup>1</sup>Oerlikon Metco (US) Inc., Westbury, NY, <sup>2</sup>Oerlikon Metco WOKA GmbH, Barchfeld-Immelborn, Germany, <sup>3</sup>Oerlikon Metco WOKA GmbH, Barchfeld, NY

#### 4:10 p.m.

**Evaluation of the Influence of Flame Spraying Parameters on Microstructure and Electrical Conductivity of Al-12Si Coatings Deposited on Polyurethane Substrates: Mr. Sayed Hossein Ashrafizadeh**, Dr. Pierre Mertiny and Dr. André McDonald, Mechanical Engineering, University of Alberta, Edmonton, AB, Canada

#### 4:30 p.m.

**Constrained Sintering on Thermally Sprayed Thermal Barrier Coatings by Mismatch of CTE Between Substrate and Yttria Stabilized Zirconia:** Mr. Guang-Rong Li, **Prof. Guan-Jun Yang**, Prof. Cheng-Xin Li and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

## **Thursday, May 14, 2015**

Corrosion 2 8:00 a.m.-10:50 a.m. Meeting Room: 101A

#### **Session Chairs:**

Dr. Rajan Bamola Surface Modification Systems Inc. Santa Fe Springs, CA USA

Dr. Shiladitya Paul TWI Cambridge, United Kingdom

#### Mr. Roger W. Kaufold

#### 8:00 a.m.

"Improved Electro-Spark Deposition Process Solves Oil and Gas Drilling Problems": Dr. Bruce Michael Warnes, Corrosion Control Consultants, Beaver, PA

#### 8:20 a.m.

**Design of Experiment for Advanced Nanostructured WC-12Co Coating HVOF: Dry Solid Particle erosion Tests: Dr. ahmed Abdullah alhamed**, Me, dublin city unversity, Dublin, Ireland

#### 8:40 a.m.

**Development of Processing Windows for New Generation HVOF Carbide-based Coatings: Dr. Andrew S.M. Ang**<sup>1</sup>, Mr. Hugo Howse<sup>2</sup>, Prof. Christopher C. Berndt<sup>1</sup> and Dr. Scott Wade<sup>1</sup>, <sup>1</sup>Industrial Research Institute Swinburne (IRIS), Swinburne University of Technology, Hawthorn, VIC, Australia, <sup>2</sup>United Surface Technology, Altona, VIC, Australia

#### 9:00 a.m.

Mitigating Corrosion of Carbon Steel in Supercritical CO2 Environments using HVOF Coatings: Dr. Shiladitya Paul, Materials Group, TWI, Cambridge, United Kingdom

#### 9:20 a.m.

**Protecting Threaded Surfaces on Tubing Strings Used in the Oil and Gas Industry:** Dr. Sergei Mankovsky<sup>1</sup>, Dr. Alexander Rigin<sup>1</sup>, Mr. Dinar Ishmukhametov<sup>1</sup>, **Mr. Grachev Oleg**<sup>2</sup> and Dr. Lev Baldaev<sup>3</sup>, <sup>1</sup>Technological systems for protective coatings, Moscow, Russia, <sup>2</sup>Technological systems of Protective Coatings, Ltd., Moscow, Russia, <sup>3</sup>TSPC Ltd., Moscow, Russia

#### 9:40 a.m.

The Use of Novel Clad Powders to Produce HVOF-Sprayed Coatings for Oil/Gas Applications: Dr. Gary Fisher<sup>1</sup>, Ms. Anita Hancox<sup>2</sup> and Dr. Tonya B. Wolfe<sup>1</sup>, <sup>1</sup>Alberta Innovates—Technology Futures, Edmonton, AB, Canada, <sup>2</sup>Allomet Corporation, North Huntingdon, PA

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

Tungsten Carbide-Based HVAF Coatings for Protection of Petrochemical, Oil Drilling and Hydro-Power Equipment Against Wear and Cavitation: Dr. Andrew A. Verstak<sup>1</sup> and R.K. Kumar<sup>2</sup>, <sup>1</sup>Kermetico Inc., Benicia, CA, <sup>2</sup>Materials Technology, Central Power Research Institute, Bangalore, India

#### Diagnostics & Characterization 8:00 a.m.-11:30 a.m. Meeting Room: 102B

#### **Session Chair:**

**Dr. Christian Moreau** Concordia University Montreal, QC Canada

#### 8:00 a.m.

**Detection and Avoiding of Unmelted Wire Pieces During Wire Arc Spraying: Mr. Alexander Atzberger,** Mr. Stefan Eichler<sup>1</sup>, Prof. Werner Mayr<sup>2</sup>, Mr. Stefan Kirner<sup>1</sup>, Dr. Jochen Zierhut<sup>3</sup>, Prof. Jochen Schein<sup>1</sup> and Dr. Stephan Zimmermann<sup>1</sup>, <sup>1</sup>Lab for Plasma Technology (LPT), EIT 1, Universitaet der Bundeswehr Muenchen, Neubiberg, Germany, <sup>2</sup>Electrical Measurement Techniques, University of Applied Sciences Munich, Munich, Germany, <sup>3</sup>Zierhut Messtechnik GmbH, Muenchen, Germany

#### 8:20 a.m.

Offline Acoustic Plasma Spray Nozzle Wear State and Characteristic Identification: Mr. Taylor K. Blair<sup>1</sup>, Dr. Gary R. Pickrell<sup>1</sup>, Mr. Michael Cybulsky<sup>2</sup>, Mr. Raymond Sinatra<sup>3</sup> and Dr. Romesh Batra<sup>4</sup>, <sup>1</sup>Materials Science and Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, <sup>2</sup>Materials, Rolls-Royce Corporation, Indianapolis, IN, <sup>3</sup>Rolls Royce Coporation, Indianapolis, IN, <sup>4</sup>ESM, VirginiaTech, BLACKSBURG, VA

#### 8:40 a.m.

Output Signal Characteristics of Thyristor- and Transistor-Controlled Power Supplies and its Influence on the Electric Discharge in a Plasma Spray Process: Hartmut Koschnitzke<sup>1</sup>, Dr. Majid Nabavi<sup>2</sup>, Mr. Uwe Jagow<sup>3</sup> and Dr. Alexander Schwenk<sup>4</sup>, <sup>1</sup>Oerlikon Metco AG (Switzerland), Wohlen, Switzerland, <sup>2</sup>RnD and Maintenance, Oerlikon Metco AG Wohlen, Wohlen, Switzerland, <sup>3</sup>Oerlikon Metco, Wohlen, Switzerland, <sup>4</sup>Sulzer Metco AG (Switzerland), Wohlen, Switzerland

#### 9:00 a.m.

**Spatial Mapping of Plasma Sprayed Coating Thickness Using X-Ray Fluorescence and Laser Triangulation: Dr. Kendall J. Hollis**<sup>1</sup>, Dr. Deborah A. Summa<sup>2</sup>, Ms. Velma M. Lopez<sup>2</sup> and Dr. George J. Havrilla<sup>2</sup>, <sup>1</sup>MST-6, Los Alamos National Laboratory, Los Alamos, NM, <sup>2</sup>Los Alamos National Laboratory, Los Alamos, NM

#### 9:20 a.m.

Eddy Current Measurement Technique For Bi-Layer Thermal Barrier Systems: Mr. Gregory M Smith, Nicholas Erb, Mats-Olov Hansson and Jimmy Johansson, GKN Aerospace Engine Systems, Trollhättan, Sweden

#### 9:40 a.m.

Effect of Spraying Parameters on the Strain of Plasma Sprayed YSZ Coatings Measured by the Digital Image Correlation Method during the Tensile Test: Mr. Lele Ruan, Mr. Zexin Yu, Prof. Weize Wang and Mr. Yufan Chen, East China University of Science and Technology, Shanghai, China

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	Refreshment Break • Meeting Space Foy	yer •
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#### 10:30 a.m.

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**On the Relationship Of Tungsten Composition To Coating Properties: Dr. Jose Colmenares**<sup>1</sup>, Mr. Ronald Molz<sup>2</sup>, Dr. Ramachandran Seshadri<sup>3</sup> and Mr. David Hawley<sup>4</sup>, <sup>1</sup>Equipment R&D, Oerlikon Metco, Westbury, NY, <sup>2</sup>Technology Research, Oerlikon Metco, Westbury, NY, <sup>3</sup>Materials Science and Engineering, Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY, <sup>4</sup>Equipment Operations, Oerlikon Metco, Westbury, NY

#### 10:50 a.m.

**Transplantation of Thermal Sprayed Coatings: Mr. Patrick Knödler**<sup>1</sup>, Mr. Achim Peuker<sup>2</sup>, Mr. Dennis Freiburg<sup>2</sup>, Mr. Maik Otten<sup>1</sup>, Dr. K. Möhwald<sup>1</sup>, Prof. Dirk Biermann<sup>2</sup> and Prof. Hans J. Maier<sup>1</sup>, <sup>1</sup>Institute of Materials Science, Leibniz Universität Hannover, Garbsen, Germany, <sup>2</sup>Institute of Machining Technology, TU Dortmund, Dortmund, Germany

#### 11:10 a.m.

Influence of Spray Parameters on the Microstructure and Properties of High Velocity Oxy-Fuel Sprayed Multimodal WC-17Co Coatings: Prof. Gang-Chang Ji<sup>1</sup>, Dr. Xiao Chen<sup>2</sup>, Dr. Hong-Tao Wang<sup>3</sup> and Xiao-Bo Bai<sup>4</sup>, <sup>1</sup>School of Mechanical & Materials Engineering, Jiujiang University, Jiujiang, China, <sup>2</sup>School of mechanical and material engineering, Jiujiang University, Jiujiang, China, <sup>3</sup>School of mechanical and material engineering, jiujiang university, jiujiang, China, <sup>4</sup>Jiujiang University, Jiujiang, China 84

# TECHNICAL PROGRAM • THURSDAY, MAY 14, 2015

#### Electronics and Semiconductor 8:00 a.m.-12:10 p.m. Meeting Room: 101B

#### **Session Chairs:**

**Dr. Jennifer Sun** Applied Materials, Inc, Sunnyvale, CA USA

Dr. Robert Gansert Advanced Materials & Technology Services, Inc Simi Valley, CA USA

#### 8:00 a.m.

Thermal Spray Coating Opportunities & Considerations in the Semiconductor Equipment Industry: Dr. Jennifer Sun, Applied Materials, Inc., Sunnyvale, CA

#### 8:20 a.m.

Functional Materials and Multilayers by Thermal Spray: Opportunities and Challenges: Dr. Sanjay Sampath, Materials Science and Engineering, Stony Brook University, Center for Thermal Spray Research, Stony Brook, NY

#### 8:40 a.m.

Latest Developments of OBZ Innovation for Cold Sprayed Electrically Conducting Coatings Applied to Electrically Insulating Ceramic Coatings: Dr. Jan Luth, Mr. Mateusz Cichosz, Mr. Michael Lehmann, Mr. SH Hartmann and Dr. Fabian Trenkle, obz innovation gmbh, Bad Krozingen, Germany

#### 9:00 a.m.

**Metallization of Ceramics by HVAF-Spraying: Mr. Roberto Puschmann**<sup>1</sup>, Dr. Filofteia-Laura Toma<sup>1</sup>, Mr. Thomas Kuntze<sup>2</sup> and Mrs. Irina Shakhverdova<sup>2</sup>, <sup>1</sup>Fraunhofer IWS, Dresden, Germany, <sup>2</sup>Fraunhofer Institute for Material and Beam Technology (IWS), Dresden, Germany

#### 9:20 a.m.

Relationship Among Process, Microstructure and Electrical/Protective Performances of Plasma Sprayed MCO coatings in SOFCs: Ms. Su Jung Han, Dr. Ramachandran Seshadri, Dr. Yikai Chen, Dr. Richard J. Gambino and Prof. Sanjay Sampath, Materials Science and Engineering, Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY

#### 9:40 a.m.

**Development of Low Oxide Reactive Metal Plasma Spray Coatings for Semiconductor Applications: Dr. Robert Gansert**<sup>1</sup> and Dr. Rajan Bamola<sup>2</sup>, <sup>1</sup>Advanced Materials & Technology Services, Inc., Simi Valley, CA, <sup>2</sup>Surface Modification Systems Inc., Santa Fe Springs, CA

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

**Effects of Process on the Coatings for Semiconductor Chamber Components: Dr. Yikai Chen**<sup>1</sup> and Dr. Jennifer Sun<sup>2</sup>, <sup>1</sup>Materials Science and Engineering, Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY, <sup>2</sup>Applied Materials, Inc., Sunnyvale, CA

#### 10:50 a.m.

**The Possibility of Application of Cold Sprayed Coatings as Conducting Paths on Polymers:** Prof. Lech Pawlowski<sup>1</sup>, **Mrs. Aleksandra Malachowska<sup>1</sup>**, Mr. Marcin Winnicki<sup>2</sup>, Prof. Andrzej Ambroziak<sup>2</sup> and Dr. Tomasz Piasecki<sup>3</sup>, <sup>1</sup>SPCTS, University of Limoges, Limoges, France, <sup>2</sup>Faculty of Mechanics, Wroclaw University of Technology, Wroclaw, Poland, <sup>3</sup>Wroclaw University of Technology, Wroclaw, Poland

#### 11:10 a.m.

**Process Dependent Microstructure and Electrical/Protective Performances of Plasma Sprayed MCO coatings in SOFCs: Mr. Gregory M. Smith,** Ms. Su Jung Han, Dr. Ramachandran Seshadri, Dr. Yikai Chen, Dr. Richard J. Gambino and Prof. Sanjay Sampath, Materials Science and Engineering, Center for Thermal Spray Research, Stony Brook University, Stony Brook, NY

#### 11:50 a.m.

Microstructure and Dielectric Properties of Thermal Sprayed Aluminum for Electrical Instrumentation Applications: Dr. Damon D. Jackson, Quantum Design Inc, San Diego, CA

# TECHNICAL PROGRAM • THURSDAY, MAY 14, 2015

#### Materials 8:00 a.m.-11:10 a.m. Meeting Room: 102C

#### Session Chair:

**Prof. Thomas W. Coyle** University of Toronto Toronto, ON Canada

#### 8:00 a.m.

Improvement of Corrosion Resistance of Thermal-Sprayed Stainless Steel Coating by Addition of Some Deoxidizing Elements: Dr. Nobuaki Sakoda<sup>1</sup>, Prof. Hidenori Era<sup>2</sup>, Mr. Kohei Hashimoto<sup>2</sup>, Dr. Zhensu Zeng<sup>1</sup> and Mrs. Sayaka Sako<sup>1</sup>, <sup>1</sup>Kurashiki Boring Kiko Co.,Ltd. Japan, Asakuchi, Japan, <sup>2</sup>Kyushu institute od Technology, Kitakyushu, Japan

#### 8:20 a.m.

Improved Corrosion Resistance of Plasma-Sprayed NiCr-Mo Coating with Shell-Core-Structured Powder by Improving Lamellar Interface Bonding: Dr. Jia-Jia Tian, Prof. Guan-Jun Yang, Prof. Cheng-Xin Li, Dr. Xiao-Tao Luo and Prof. Chang-Jiu Li, State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an, China

#### 8:40 a.m.

An Investigation on Microstructural Properties of Plasma Sprayed Tungsten Carbide Enhanced with Partially Stabilized Zirconia: Ms. Sahar Abuali Galedari<sup>1</sup>, Mr. Mehdi salimi Jazi<sup>1</sup>, Prof. Fardad Azarmi<sup>1</sup>, Prof. Ying Huang<sup>2</sup> and Prof. Xiangqing. W Tangpong<sup>1</sup>, <sup>1</sup>Mechanical Engineering, North Dakota State University, Fargo, ND, <sup>2</sup>Civil and Environmental Engineering, North Dakota State University, Fargo, ND

#### 9:00 a.m.

The Many Facets and Complexities of 316L and the Effect on Properties: Mrs. Ingrid Hauer Miller, Surface coating, Höganäs AB, Höganäs, Sweden

#### 9:20 a.m.

Effect of Microstructure, Morphology and Amount of Tungsten Carbides on the Properties of Laser Cladded MMC Coatings: Ms. Barbara Maroli and Dr. Senad Dizdar, Global Development, Höganäs AB, Höganäs, Sweden

#### 9:40 a.m.

Synthesis of Thermal Spray Grade Silicon Carbide Feedstock Powder for Plasma Spray Deposition: Mr. Fahmi Mubarok and Prof. Nuria Espallargas, Department of Engineering Design and Materials, NTNU, Trondheim, Norway 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

Thermal Sprayed Luminous Metallic and Cceramic Coatings for Wear Indication and Product Authentication: Mr. Michael Lehmann, Obz Innovation Gmbh, Bad Krozingen, Germany

#### 10:50 a.m.

Al/Al<sub>2</sub>O<sub>3</sub> Cermets by Plasma Spraying: Optical Response of Experimental and Numerical Materials: Denis Toru<sup>1</sup>, Dr. Aurélie Quet<sup>1</sup>, Dr. Domingos De Sousa Meneses<sup>2</sup>, Romain Echegut<sup>2</sup>, Dr. Leire Del Campo<sup>2</sup>, Hervé Piombini<sup>1</sup>, Dr. Patrick Echegut<sup>2</sup> and Dr. Luc Bianchi<sup>1</sup>, <sup>1</sup>CEA DAM Le Ripault, Monts, France, <sup>2</sup>CNRS-CEMHTI, Orléans, France

#### Materials and Technology 8:00 a.m.-11:10 a.m. Meeting Room: 104A

#### 8:00 a.m.

Synthesis of TiC/Ti Hybrid Coating by Reactive Plasma Spraying at Low Pressure: Dr. Pengjiang He<sup>1</sup>, Mr. Frederic lapostolle<sup>1</sup> and **Prof. Hanlin LIAO<sup>2</sup>**, <sup>1</sup>IRTES-LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France, <sup>2</sup>IRTES-LERMPS, University of Technology Belfort—Montbéliard, Belfort, France

#### 8:20 a.m.

Effect of Strain Rate on Microstructure Evolution and Compressive Deformation Behavior of High Strength Copper Coating Materials Fabricated by the Kinetic Spray Process: Prof. Kee-Ahn Lee<sup>1</sup>, Mr. Min-Suk Baek<sup>1</sup>, Mr. Young-Kyun Kim<sup>1</sup> and Dr. Hyung Jun Kim<sup>2</sup>, <sup>1</sup>Department of Advanced Materials Engineering, Andong National University, Andong-si, South Korea, <sup>2</sup>RIST, Pohang, South Korea

#### 8:40 a.m.

The Particle Properties Sprayed by APS of Different Steels Composition During the Flight: Mr. Rodolpho Fernando Vaz<sup>1</sup>, Dr. Anderson Geraldo Marenda Pukasiewicz<sup>2</sup>, Dr. Ramón Sigifredo Cortez Paredes<sup>3</sup> and Mr. Andre Chicoski<sup>1</sup>, <sup>1</sup>Mechanical Engineering, LACTEC Institute of Technology for Development, Curitiba, Brazil, <sup>2</sup>Mechanical Engineering, UTFPR—Ponta Grossa, Ponta Grossa, Brazil, <sup>3</sup>UFPR, Curitiba, Brazil

# TECHNICAL PROGRAM • THURSDAY, MAY 14, 2015

#### 9:00 a.m.

To Study the Behavioral Characterization of SS304 and SS310 Steel Coated with NiCr-Cr2C3 Alloy by Manual Metal Arc Welding: Mr. Gurpyar Singh, Mechanical Engineering, GURU KASHI UNIVERSITY, Bathinda, India

#### 9:20 a.m.

The Effect of Heat Treatment on Microstructure And Tensile Properties of Cu-Based Composites Reinforced with Zr57Cu20Al10Ni8Ti5 Metallic Glass: Mr. Nan KANG, Dr. Pierre CODDET, Prof. Hanlin Liao and Prof. Christian CODDET, LERMPS, University of Technology of Belfort-Montbéliard, Belfort, France

#### 9:40 a.m.

Wear and Friction Behavior of Plasma Nitrided Hot Forming Tool Steels: Mr. Sunpreet Singh and Dr. Manpreet Kaur, Mechanical, Baba Banda Singh Bahadur Engineering College, Fatehgarh Sahib, Punjab, India, Fatehgarh Sahib, India

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

**Surface Modification of Ceramic Thermal Sprayed Coatings by Sealing: Ms. Alsu Ahmetgareeva**<sup>1</sup>, Dr. Lev Baldaev<sup>1</sup>, Mr. Sergey Baldaev<sup>1</sup>, Dr. Tat'yana Il'inkova<sup>2</sup> and Mr. Ivan Mazilin<sup>1</sup>, <sup>1</sup>TSPC Ltd., Moscow, Russia, <sup>2</sup>Kazan National Research Technical University named after A. N. Tupolev, Kazan, Russia

#### 10:50 a.m.

Effect of Expansion Ratio of Rectangular Nozzles on Spray Pattern of Copper Coatings in Cold Spraying: Prof. Kazuhiko SAKAKI<sup>1</sup>, Mr. Takuma AKASHI<sup>2</sup> and Dr. Takashi HOSONO<sup>1</sup>, <sup>1</sup>Faculty of Engineering, SHINSHU University, Nagano City, Japan, <sup>2</sup>Chubu Plant Service Co.,Ltd., Nagoya, Japan Tribological, Oxidation, Corrosion Behavior of Aerospace-based Coatings 8:00 a.m.-11:30 a.m. Meeting Room: 102A

#### **Session Chairs**:

**Prof. Petri Vuoristo** Tampere University of Technology Tampere, Finland

**Dr. Rogerio S. Lima** National Research Council of Canada (NRC) Boucherville, QC Canada

#### 8:00 a.m.

**Cold Spray and Reaction Sintering of Ti-TiAl3 Composite Coatings: Dr. Volf Leshchynsky**<sup>1</sup>, Dr. Oleksandra Bielousova<sup>2</sup> and Prof. Anatoli Papyrin<sup>3</sup>, <sup>1</sup>Institute for Diagnostic Imaging Research, University of Windsor, Windsor, ON, Canada, <sup>2</sup>DIPI Laboratory, Ecole Nationale d'Ingenieurs de Saint-Etienne (ENISE), Saint-Etienne, France, <sup>3</sup>Cold Spray Technology, Albuquerque, NM

#### 8:20 a.m.

The Micro Structure and Tribological Properties of Liquid-Fuel HVOF Sprayed Fine Wc-Co-Cr Coating: Mr. Rohit Upadhyaya<sup>1</sup>, Dr. Sharad Shrivastava<sup>1</sup>, Mr. S.C Modi<sup>2</sup> and Mr. A Modi<sup>2</sup>, <sup>1</sup>Birla Institute of Technology and Science ,Pilani INDIA, Pilani, India, <sup>2</sup>R&D, Metallizing Equipment Company, Jodhpur, India

#### 8:40 a.m.

**High Temperature Coatings Based on Aluminum Phosphate: Dr. Lingyan Kong**, DIVISION OF SUR-FACE ENGINEERING, Institute of metal research, CAS, Shenyang, China

#### 9:00 a.m.

Preparation and Oxidation Behavior of Thermal Barrier Coatings with a TiAl3 Bond Coat on  $\gamma$ -TiAl Alloy: Prof. Tianying Xiong, DIVISION OF SURFACE ENGINEERING, Institue of metal research, CAS, SHEN-YANG, China

#### 9:20 a.m.

**Effect of Particle Morphology on the Tribological Behavior of Cold Sprayed Al MMC Coatings:** Mr. J. Michael Shockley<sup>1</sup>, **Prof. Richard R. Chromik**<sup>1</sup>, Dr. Sylvie V. Descartes<sup>2</sup> and Dr. Phuong Vo<sup>3</sup>, <sup>1</sup>Mining and Materials Engineering, McGill University, Montreal, QC, Canada, <sup>2</sup>Laboratoire de Mécanique des Contacts et des Structures, INSA de Lyon, Lyon, France, <sup>3</sup>National Research Council Canada, Boucherville, Montreal, QC, Canada

#### 9:40 a.m.

**Preparation and Oxidation Behavior of a TiAl3 Coat on TiAl Alloy by Cold Spray: Prof. Tianying Xiong**, DIVISION OF SURFACE ENGINEERING, Institute of metal research, CAS, Shenyang, China

> 10:00 a.m.-10:30 a.m. • Refreshment Break • Meeting Space Foyer •

#### 10:30 a.m.

LaMgAl11019 Coating for Thermal Barrier Applications Produced by EB-PVD: Dr. Armen Kuzanyan<sup>1</sup>, Silva Petrosyan<sup>2</sup>, Georgi Badalyan<sup>1</sup>, Astghik Kuzanyan<sup>1</sup> and Prof. Vassilis Stathopoulos<sup>3</sup>, <sup>1</sup>MS, Institute for Physical Research, National Academy of Sciences, Ashtarak, Armenia, <sup>2</sup>LLFS, Institute for Physical Research, National Academy of Sciences, Ashtarak, Armenia, <sup>3</sup>Department of Electrical Engineering, Technological Educational Institute of Sterea Ellada, Psachna Chalkida, Greece

#### 10:50 a.m.

**Preparation of Inorganic Ceramic Coatings on**  $\gamma$ **-TiAl Alloys: Dr. Lingyan Kong**, DIVISION OF SUR-FACE ENGINEERING, Institute of metal research, CAS, Shenyang, China

#### 11:10 a.m.

Effects of the Heat Treatments on the Corrosion Rate of Ni-base Alloy Coatings Applied by Thermal Spray: Dr. José Cabral<sup>1</sup>, Mrs. Jamnie Achem<sup>1</sup>, Dr. Facundo Almeraya<sup>2</sup>, Dr. Patricia Zambrano<sup>3</sup>, Dr. Carlos Poblano<sup>4</sup> and Dr. Citllalli Gaona<sup>2</sup>, <sup>1</sup>Universidad Autónoma de Nuevo León, San Nicolás de los Garza, Mexico, <sup>2</sup>Aeronautical Materials, Universidad Autonoma de Nuevo Leon, Apocada, Nuevo León, Mexico, <sup>3</sup>Facultad de Ingeniería Mecánica y Eléctrica, Universidad Autónoma de Nuevo León, San Nicolas de los Garza, Mexico, <sup>4</sup>Centro de Tecnologia Avanzada, El Marques, Mexico

# **ITSC 201**!

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# WELCOME





d like to welcome each of you to the 2015 IMS Microstructural Characterization of Aerospace Materials and Coatings—co-Located with AeroMat and ITSC here in Long Beach, California. It is a very exciting time for IMS as we continue to grow and adapt, yet remain motivated and responsive to the needs and challenges in our industries and we feel that the co-location with AeroMat and ITSC will help bring top speakers and innovative topics to you in one location. The Microstructural Characterization of Aerospace Materials and Coatings is an exciting area in which to work, study, and play, and we will continue to meet and bring inspired people together in forums like this, to ensure IMS remains at the cutting edge in our industries.

With the co-location we believe this year's conference will draw attendance from leading companies and professionals from all over the world. There are speakers representing industry, government policy makers, as well as academic scholars and researchers will present and discuss the latest topics in Aerospace material processing, focusing on strategies, concepts and techniques.

Here is what you can expect to experience and see as well as what we hope to achieve over the next few days here in Long Beach.

We have a hands on workshop scheduled on how to organize and run a failure investigation with Dr. Dan Dennies as the instructor.

There are more than 15 speakers and sessions ranging from failure analysis, characterization of aerospace fasteners, phase stability in high cobalt containing nickel based super alloys, to recent innovations for characterizing metallic aerospace materials with electron backscatter diffraction. And many other talks on microstructural characterization of aerospace materials.

I'd like to thank each of you for attending our conference and bringing your expertise to our gathering. As organization leaders, who have the vision, knowledge, the wherewithal, and the experience to help us pave our way into the future. You are truly our greatest asset today and tomorrow, and we could not accomplish what we do without your support and leadership. Throughout this conference, I ask you to stay engaged, keep us proactive and help us shape the future of IMS.

#### Sincerely, Brian Joyce, IMS Event Committee Chair

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# **2015 IMS ORGANIZING COMMITTEE**

Thank You to the Microstructural Characterization of Aerospace Materials and Coatings (IMS) Organizing Committee for their time and support in making this a successful event

> Mr. Brian J. Joyce, Chair Regional Sales Manager Barton International

**Mr. David Chang** Technical Surveillance Metallurgist Rolls-Royce Corporation

**Dr. Donald F. Susan** Principal Member of Technical Staff Sandia National Laboratories

#### **Mr. Jaret Frafjord**

Technical Director Curtiss-Wright

Mr. James Martinez Materials Scientist

NASA Lyndon B. Johnson Space Center

<u>|</u>2

Proceedings can be found online at asminternational.org. See page 3 for download instructions.

The IMS Technical Program is in Room 203C.

# Monday, May 11, 2015

8:30-8:45 a.m. Welcoming Remarks – Brian Joyce (15 min)

# **SESSION1**

#### Session Chair:

Brian Joyce Barton International

#### 8:45-9:15 a.m.

**Dan Dennies,** Exponent Failure Analysis Associates How Things Go Wrong- Case Studies in Failure Analysis & R&D

#### 9:15-9:45 a.m.

**Frauke Hogue,** *Hogue Metallography* Characterization of Aerospace fasteners - Structures and Imperfections

#### 9:45–10:15 a.m.

#### **Tom Murphy,** *Hoeganaes Corporation* Metallographic Testing of Powders Intended for Additive Manufacturing

#### 10:15-11:15 a.m.

VIP Expo Tour or free time to attend ITSC and AeroMat Technical Sessions. (Note: Qualified attendees were notified regarding the acceptance into the VIP Expo Tour.)

#### 11:15 a.m.-12:00 p.m.

Keynote presentation **Hamish L Fraser,** The Ohio State University Director, Center for the Accelerated Maturation of Materials

12:00 - 1:15 pm • Lunch • Exhibit Halls A&B •

#### COMBINED PLENARY SESSION (IMS/AEROMAT/ITSC) ON THE SHOW FLOOR

**1:30 pm–3:00 pm** Dr. John Grotzinger Chief Scientist and Head of Strategic Planning for the Mars Rover Mission

3:00 - 3:30 p.m. • Refreshment Break • Exhibit Halls A&B •

# **SESSION 2**

#### Session Chair: Rick Blackwell ITW Buehler

3:30-4:00 p.m.

**Gabe Lucas,** *Scot Forge Company* Revealing Overheating in Aluminum Alloy 7050

#### 4:00–5:30 p.m.

Dedicated time to visit Exhibitors or to attend Aero-Mat/ITSC Sessions.

5:30 pm - 7:00 p.m. • Expo Welcome Reception • Exhibit Halls A&B •

# TECHNICAL PROGRAM • TUESDAY, MAY 12, 2015

# Tuesday, May 12, 2015

## **SESSION 3**

**Session Chair:** 

David Chang Rolls-Royce Corporation

#### 8:30–9:00 a.m.

**Lisa Deibler,** Sandia National Laboratories Microstructural and Mechanical Characterization of Direct Metal Laser Sintered AlSi10Mg

#### 9:30-10:00 a.m.

**Jeff Rodelas,** *Sandia National Laboratories* Artifact-Free Determination of Weld Metal Constitution in Austenitic Stainless Steels

#### 10:30-11:00 a.m.

. . . . . . . . . . . .

Matt Nowell, EDAX Inc.

Recent Innovations for Characterizing Metallic Aerospace Materials with Electron Backscatter Diffraction (EBSD)

10:00-10:30 a.m.

• Refreshment Break • Exhibit Halls A&B •

## **SESSION 4**

#### Session Chair:

**Donald Susan** Sandia National Laboratories

#### 10:30-11:00 a.m.

**George Wildridge,** *IMR* Microstructural Characterization of Machined Surfaces in Aerospace Alloys

#### 11:00 a.m.-11:30 p.m.

**P.M. Mignanelli,** *University of Cambridge (UK)* The Role of Solid Solution Strengthening Additions and Thermal Exposure on the Behaviour of a Model Nickel-base Superalloy

> 12:00 - 1:00 p.m. • Lunch • Exhibit Halls A&B •

#### 1:00 – 3:30 p.m.

COMBINED PLENARY SESSION (ITSC/AeroMat/IMS)

#### 1:00 p.m.

**Aeromat:** Mr. Humberto Luiz de Rodrigues Pereira presenting on Advanced Structural Materials

#### 1:45 p.m.

ITSC/TSS Award Presentations

#### 2:00 p.m.

**ITSC:** Dr. Robert Vaßen, Recent Advances in Thermal Sprayed Thermal Barrier Coatings: including new materials, innovative thermal spray processes and advanced performance assessment methods

#### 2:45 p.m.

**IMS:** Dr. Frank Muecklich, European School of Materials presenting on Understanding Microstructure Formation by 3D Analysis in the Micro, Nano and Atomic Scale

3:30 - 4:00 p.m. • Refreshment Break • Exhibit Halls A&B •

# **SESSION 5**

Session Chair: Brian Joyce Barton International

#### 4:00-4:30 p.m.

Asim Tewari, IIT Bombay

Microstructural Deformation in Shear Zones during Machining of Titanium Alloys with Varying  $\beta$  Phase Fraction

#### 4:30-5:00 p.m.

**K.A. Christofidou,** *University of Cambridge (UK)* Phase Stability in High Cobalt Containing Nickel Based Superalloys

7:00 p.m.-10:00 p.m. • Social Event\*• Queen Mary Transportation Provided at Hyatt Regency and Hyatt Pike• \*Ticket Required & Sold Separately

# TECHNICAL PROGRAM • WEDNESDAY, MAY 13, 2015

# Wednesday, May 13, 2015

## **SESSION 6**

#### 8:30-9:00 a.m.

**Baillie McNally,** *Worcester Polytechnic Institute* Experimental Verification of Through-Process Modeling of Cold Spray Al Alloys

#### 9:00-9:30 a.m. Tony Havics

A Few Microscopical Techniques for the Characterization of Materials

#### 9:30–10:00 a.m.

**Asim Tewari,** *IIT Bombay* Stereological Estimation of Damage Evolution in CFRP under Cyclic Loading

10:00 - 10:30 a.m.

• Refreshment Break • Exhibit Halls A&B •

#### 10:45-1:15 p.m.

Allied Facility Tour Boarding begins at 10:45 a.m. Departs Hyatt Regency at 11 a.m. Arrives at Plant at 11:20 a.m. Tour Begins 11:30 Refreshment & Networking Break: 12:15–12:45p.m. Boarding begins at 12:45 pm Bus Departs at 12:55 pm Arrives at Hyatt Regency at 1:15 pm

#### End of conference

# **EDUCATION COURSE**

# EDUCATION WORKSHOP WILL BE CONDUCTED ON SUNDAY, MAY 10TH AT THE HYATT REGENCY LONG BEACH

**Instructor:** Daniel P. Dennies, Ph.D, P.E., FASM **Course:** How to Organize and Run a Failure Investigation

Date: Sunday, May 10, 2015

Time: 8:30 am-4:30 pm

The course is included in the conference registration fee

#### **Course Objective**

You will learn a proven systematic approach to failure investigation, which utilizes examples from the aerospace industry and teaches the steps you need to follow. The effect of various failure sources, such as corrosion, on the organization of the investigation will be analyzed. It will provide a learning platform for engineers from all disciplines; materials, design, manufacturing, quality and management.

#### Who Should Attend?

- Engineers
- Technicians
- Managers
- Designers
- TQM Personnel
- Lawyers

#### Learning Objectives

Upon completion of this course, you should be able to:

- Identify the steps necessary in any failure investigation
- Describe the benefits of an organized failure investigation
- Apply the steps to a systematic approach for problem solving
- Employ fault tree analysis, failure mode assessment and technical plan creation
- Assess how different failure sources alter the investigation process

# SHOW DIRECTORY 95



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\*layout map as of April 20, 2015

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# **SHOW FLOOR PLAN**

VIP Lunch



# **EXHIBITOR HOURS & DATES**

#### **Exhibitor Hours**

#### Monday, May 11, 2015

12:00 p.m.–7:00 p.m. Lunch: 12:00 p.m.–1:15 p.m. *A Tasting of International Cuisine* Afternoon Refreshment Break: 3:00 p.m.–3:30 p.m.

Expo Welcome Reception: 5:30 p.m.-7:00 p.m.

#### Tuesday, May 12, 2015

9:00 a.m. – 4:00 p.m. Morning Refreshment Break:10:00 a.m.–10:30 a.m.

Lunch: 12:00 p.m.–1:00 p.m. A Taste of California Sponsored By:

Afternoon Refreshment Break: 3:30 p.m.-4:00 p.m.

#### Wednesday, May 13, 2015

9:00 a.m.-4:00 p.m. Morning Refreshment Break: 10:00 a.m.-10:30 a.m. Afternoon Refreshment Break: 3:00 p.m.-3:30 p.m. \**Times are tentative and subject to change.* 

Exhibitor Legend	
AeroMat	
ITSC	
IMS	



EXhibitor	BOOTH NO.
3M Abrasives Systems Division	1609
Aeromet International PLC	836
AIM MRO	1523
Allied High Tech Products	1336
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AMETEK Specialty Metal Products	1631
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ASB industries, inc	1519
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All Ralaze Nanoanalysis Air Liquido	1008
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Cohorent Inc.	020
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Dewal industries, inc.	1309
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ES3	1337
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FUJIMI INCORPORATED	1330
Ganzhou Achteck Tool Technology Co., Ltd.	1430
GeoCorp, Inc.	923
GF Machining Solutions LLC	839
Global Tungsten & Powders Corp.	1412
Granta Design	927
Green Belting Industries Limited	1505

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HORIBA Scientific	724
Houghton International	932
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Indiana Precision Grinding	1606
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	ZL Diamond Technology Co.,Ltd.	1332

# **VIP EXPO TOUR**

#### **Allied High Tech Products, Inc. Booth 1336**



Allied's newly updated TechCut 5 Precision Saw will be demonstrated. The saw features a unique interchangeable fixturing system that allows both T-Slot and X-Axis tables to be used, and has a manual wheel to control sample advancement.

www.alliedhightech.com

#### **Buehler** Booth 737



#### PlanarMet 300 Planar Grinder

Looking to save time in your daily work? The PlanarMet 300 is a compact unit that minimizes space and power requirements while providing high material removal rates and fine surface finishes. Time savings continue beyond just grinding time with quick stone changes, auto dressing and direct specimen holder integration with the EcoMet AutoMet 250/300 series grinder-polisher. Two stones provide solutions for a variety of materials, including those in the aerospace field. www.buehler.com

#### GeoCorp. Booth 923



Thermocouples & Thermocouple Wire Sourcing the correct thermocouple and thermocouple wire to meet today's tighter aerospace quality specifications. www.geocorpinc.com

#### H.C. Starck GmbH **Booth 1323**



Overview about the company/Division surface technology; product portfolio and latest product developments. http://www.hcstarck.com

#### LQ Material Technologies Co. **Booth 1612**



Thermal spray systems, peripherals, integrations, powder and wires

LQ is a company in China manufactures thermal spray systems (incl. flame, arc APS and HVOF spray systems) and peripherals (incl. turntable, lathe, booth, dust collector and tailored made automatic system), the company is especially good at integration of a turnkey project with many years of experiences in the past 20 years in China. LQ also makes thermal spray powder and wire. Besides regular ceramic, alloy, metal, WC based powder, LQ tailored develops new powder for customer. On wire, LQ provides both solid and cored wire.

www.langqiaosurface.com

# North American Höganäs 🖽

#### **North American Hoganas**

#### **Booth 1436**

#### **Powder Coating Solutions**

Hoganas offers a wide range of powders all with that extra service covering the global market. Whatever the spray deposition or welding process you use each affects the final result. 2015 presentational highlights include - mapping of metal matrix carbide type, morphology and amount of WC on wear resistance and microstructure. HVOF vs HVAF effect on erosive wear of Fe base materials such as 6AB. Influence of part size and geometry on properties when laser cladding. Whatever your challenges, take this opportunity to book a meeting with our technical experts during the show. www.hoganasthermalspray.com

#### œrlikon Oerlikon Metco (US) Inc. **Booth 1111** metco UniCoatPro

Oerlikon Metco 2015 Material Highlights and overview of the new thermal spray controller platform, the UniCoatPro, a feature-rich system platform for all types of spray shops. It combines simple touchscreen operation and the latest safety features with high productivity functionality. www. oerlikon.com/metco

#### SEDS@UCSD

#### **Booth 728**

**Tri-D engine** 



The Tri-D engine is the 1st ever additive manufactured engine designed, printed and successfully tested by a collegiate team with the intention to be the 3rd stage engine of a 3 stage nanosat launcher. It's composed of cobalt chromium and designed for 200 lbs of thrust.

http://seds.ucsd.edu/

#### **TEC Materials** Testing **Booth 1032**



TEC is a small, high-tech company that offers state-of-theart x-ray diffraction systems and accredited lab services to measure residual stress and retained austenite. We can make measurements in our Knoxville, TN laboratory or at your facility. These measurements are a cost-effective way to locate potential failures in aircraft components before they are put in service.

www.TECstress.com

#### UniqueCoat **Technologies**, LLC **Booth 1315**



#### HVAF thermal spray equipment

UniqueCoat Technologies will introduce its line of thermal spray equipment including guns for spraying metals and carbide and internal diameters. UCT specializes in HVAF technology which allows users to spray high quality coatings at a much lower cost than HVOF. They also provide powder feeders, twin wire arc equipment, project management, and engineering services. Come see their latest innovation, a fuel gas pumping station whicfh can instantly run multiple spray systems even in cold environments. www.uniquecoat.com

#### 3M Abrasives Systems Division Booth 1609

Traditional grinding and finishing methods are proving less effective on many newer, hard-to-grind materials – slowing down production and driving up costs. Now, from rough grinding to final finishing, 3M brings you a complete range of thermal spray solutions designed to meet today's tough processing challenges.

www.3M.com/thermalspray

#### Aeromet International PLC Booth 836

Aeromet are a premier manufacturer of aluminium investment and sand castings for the aerospace industry, worldwide. Being fully aerospace accredited, Aeromet, supply castings that are machined, surface finished and in kit-form, to customers' requirements. Aeromet are aerospace approved and in serial production with A20X<sup>®</sup>, the world's strongest cast aluminium alloy.

www.aeromet.co.uk

#### AIM MRO Booth 1523

AIM MRO is a Global leader in the manufacture of super alloy braze products and special process materials used in the original manufacture and repair of turbine components. Our custom manufacturing of braze products, coating and process protective masks and machined and fabricated details provide our customers "one stop shop". *www.aimmro.com* 

Allied High Tech Products, Inc. Booth 1336

For over 32 years, Allied High Tech Products has provided quality products for metallographic sample preparation & analysis. Items on display include Allied's robust MetPrep 4<sup>™</sup> Grinding/Polishing System and precise TechCut 5<sup>™</sup> Sectioning Machine, as well as Carl Zeiss microscopes. A full range of consumable products will also be shown. *www.alliedhightech.com* 

#### American Stress Technologies, Inc. Booth 1018

AST provides laboratory services and turnkey systems to measure residual stress and stress related material defects. Our technologies include x-ray diffraction (XRD), hole drilling, ESPI and Barkhausen noise analysis. Applications include analysis and quality control of machining, grinding, heat treatment, welding, forming, & forging of engineered materials. Our products include XStress, Rollscan and Prism. *www.gstresstech.com* 

#### AMETEK Specialty Metal Products Booth 1631

AMETEK Specialty Metal Products is a world leader in the research, development and manufacture of water and gas atomized stainless powders, thermal spray powders and other high nickel alloy materials. End markets include energy, automotive, chemical, appliance, lawn & garden, agriculture and lock and hardware, to name a few.

http://www.powderclad.com/

#### AMS Booth 1408

We produce and supply the customer design thermal spray Auxiliary equipment including spray room, dust collector, parts and spray gun manipulator, automatic blasting system. Whether you are looking for thermal spray equipment, turnkey installation solutions or coating service, we are your trustworthy and best partner.

http://www.amstechn.com/

# AMT AG

#### Booth 1605

Established in 1975 in Switzerland today AMT AG is one of the leading suppliers of high sophisticated turnkey thermal spray installations, thermal spray components and thermal spray spare and wear parts. During the last ten years AMT AG delivered more than 110 thermal spray installation equipped with the latest technology all around the world. *www.amt-ag.net* 

#### ANR Fabrication Booth 1510

#### Ardleigh Minerals, Inc. Booth 1339

Since its inception, Ardleigh Minerals has been specializing in the recycling of materials generated in thermal spray preparation and processing, including cold, flame, HVOF, plasma and wire arc spraying. Ardleigh proudly serves the aerospace, automotive, catalytic, electronic, and thermal spray industries. *www.ardleigh.net* 

#### Artec S.p.A./Turbocoating S.p.A. Booth 1405

ARTEC supplies coating solutions and systems (APS, LPPS/VPS, HVOF) with guarantee on quality and productivity. These include process development, technology transfer, turnkey equipment and services, personnel training and component qualificiation. ARTEC is also specialized in other related process engineering and VPS/LPPS system refurbishment.

bismuth telluride lutetium granules metamaterials electrochemistry solid thin film dysprosium pellets atomic layer deposition scandium-aluminum spersions aerospace ultra-light alloys nan van He green technology battery lithium gallium arsenide hiah С Ν F Ne Be Ο Li В tals surface functionalized nanoparticles tantalu Na Mg AI Si Ρ S CI Ar palladium shot ermet Fe Co Ni Sc Kr Κ Ca Ti V Cr Mn Cu Zn Ga Ge As Se Br cathd Rb Sr Υ Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn Sb L Xe Те con Cs Rn Ba La Hf Та W Re Os Ir Pt Au Hg TL Pb Bi Po At FI galli Fr Ra Ac Rf Db Sg Bh Hs Mt Ds Rg Cn Uut Uup Lv Uus Uuo Tm Yb Lu ar energy Pr Nd Pm Sm Eu Gd Tb Dy Ho Ce Er Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lr nanofabrics rare earth metals nickel foam LED lighting rod platinum ink laser crystals titanium robotic parts tungsten carbide mischmetal Ve optoelectronic hafnium tubing sputtering targets gadolinium wire advanced polymers buckey balls AMERICAN tellurium EMENTS catalog: americanelements.com THE MATERIALS SCIENCE COMPANY ® ©2001-2015. American Elements is a U.S. Registered Trademark

# **COMPANY DESCRIPTIONS**

#### ASB Industries, Inc. Booth 1519

ASB Industries located on Ohio, USA will feature High Pressure Cold Spray equipment in conjunction with Impact Innovations. Our partnership focuses on materials and equipment development required to achieve unique repairs, OEM production components and additive manufacturing applications in Aerospace, Automotive, oil and gas and more. *www.asbindustries.com* 

#### ASM International Booth 1029

ASM International was founded in 1913 as the American Society for Metals. Today, ASM is the world's largest association of metals-centric materials scientists and engineers with over 30,000 members worldwide. ASM is dedicated to informing, educating and connecting the materials community to solve problems and stimulate innovation around the world. *www.asminternational.org* 

#### ATI

#### **Booth 1008**

ATI is one of the largest most diversified specialty materials and components producers in the world. We focus our advanced specialty materials technology, unsurpassed manufacturing capabilities, and innovative products to serve global end use markets with highly diversified and specialized product offerings. *www.atimetals.com* 

#### Balazs Nanoanalysis—Air Liquide Booth 838

Balazs<sup>™</sup> Nanoanalysis, a division of Air Liquide Electronics U.S. LP, operates ISO 17025 accredited laboratories that specialize in identifying ultra-trace level contamination. Balazs' expertise covers materials used in the electronics and other high-tech industries. With each analysis, Balazs brings 40 years of experience to help engineers control their process. *www.balazs.com* 

#### Bay State Surface Technologies, Inc. Booth 1437

Bay State has been manufacturing a complete line of affordable Plasma, Twin-Wire, and Flame Spray equipment for over 50 years. All Bay state equipment is US-made and we also provide a full line of support equipment for complete turnkey solutions. Award winning quality and service, and AS9100 and ISO9001 registered.

www.baystatesurfacetech.com

#### Boeing Company Booth 823

Boeing is the world's largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems. A top U.S. exporter, Boeing supports airlines and U.S. and allied government customers in 150 countries. Boeing employs more than 165,000 people across the U.S. and in more than 65 countries. *www.boeing.com* 

Buehler Booth 737

By partnering with customers to develop solutions for materials preparation, testing & analysis, Buehler provides equipment and consumables solutions for specific applications and needs. With a strong history in metallography, our knowledge is easily applied to components and sub components, as well as for more specialized materials.

www.buehler.com

#### C&M Technologies Booth 1229

C&M Technologies: Production and distribution of premium carbide materials for thermal spraying, laser cladding, welding and other hardfacing processes. Our focus and expertise in carbide materials production and research & development make us a highly qualified partner for you! www.c-m-tech.com

#### California Heating Equipment Booth 739

CHE has over 80 years combined staff experience manufacturing industrial furnaces for the Aerospace, Automotive, Commercial and Military industries. Along with our heat treating equipment services we represent Tenaxol quenchants and INEX silcone carbide tubes. We are a one stop heat treat equipment shop.

www.chefurnaces.com

#### Carpenter Powder Products Booth 1610

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# **COMPANY DESCRIPTIONS**

#### Castolin Eutectic Booth 1423

Worldwide leader of application solutions in maintenance, repair and wear protection, Castolin Eutectic helps you improving your machinery's lifetime, based on more than 100 years of experience in welding, brazing and thermal spraying technologies for professional and innovative solutions. Our motto: Quality, Service and Technical Leadership = Customer Value Added.

www.castolin.com

#### CenterLine (Windsor) Limited Booth 1615

CenterLine's Supersonic Spray Technologies Division (SST<sup>™</sup>) manufactures cold gas dynamic spray (Cold Spray) metal coating systems and supplies to protect, repair, restore, and refinish manufactured products. SST also performs cold spray research and supplies process development assistance to identify commercially viable applications for Cold Spray technology. *www.cntrline.com* 

#### Cincinnati Thermal Spray Booth 1313

CTS provides high technology coatings to improve the performance of products throughout a variety of industries. We provide solutions in the form of thermal spray coating, dry film lubricants, porcelain enamels, anti-corrosion paints, and protective sealers, along with turnkey service to machine and coat a final product.

www.cts-inc.net

#### Coherent Inc. Booth 1613

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#### Control Vision Booth 1237

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#### Curtiss-Wright Surface Technologies Booth 725

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www.cwst.com

#### **DeWAL Industries, Inc.** Booth 1309

DeWAL Industries is the leader in the manufacture of Thermal, Plasma and HVOF tapes in both single ply and double ply options, holding GE, Pratt & Whitney and Rolls Royce approvals. The double ply tapes are used in the most severe applications and provide an economical solution to multi-layer masking. *www.dewal.com* 

#### DIAMANT Metallplastic GmbH Booth 1414

DIAMANT Metallplastic GmbH is a full-service provider of high quality metal-polymer materials for the metal-working industry. DIAMANT sealers protect thermal spray coatings from corrosion and provide resistance to mechanical and chemical stresses. All products are manufactured in Germany and can be customized for your application.

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# **COMPANY DESCRIPTIONS**

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#### Booth 933

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www.edax.com

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#### Booth 1337

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www.fluxtrol.com

#### FUJIMI INCORPORATED Booth 1330

#### Ganzhou Achteck Tool Technology Co.,Ltd Booth 1430

Ganzhou Achteck Tool Technology Co.,Ltd is a lead manufacturer of the Thermal Spray Powders in China. Achteck offers the powders used in HVOF,HVAF or APS equipments and the product series cover various industries such as Oil&Gas,Steel,Automotive,Paper,Power,etc. Achteck is ISO 9001 certified ensuring our customers high quality and consistent products. *www.achteck.com.cn* 

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www.geocorpinc.com

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www.gfms.com/us

#### **Global Tungsten & Powders Corp. Booth 1412**

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www.globaltungsten.com

#### **Granta Design** Booth 927

Granta Design is the world leader in materials information technology. Our materials data and information management solutions help engineering enterprises to: manage critical data; enable better materials decisions; design for environmental objectives and regulations; and provide materials support for engineering design, analysis, and simulation. www.grantadesign.com

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www.hcstarck.com

#### HAI Advanced Material Specialists, Inc. **Booth 1536**

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#### **HORIBA Scientific** Booth 724

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#### Imerys Fused Minerals Murg GmbH **Booth 1433**

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#### Impact Innovations GmbH **Booth 1618**

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www.impact-innovations.com

#### **Indiana Precision Grinding Booth 1606**

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#### **International Thermal Spray** Association **Booth 1633**

The International Thermal Spray Association, a Standing Committee of the American Welding Society, is a professional industrial organization dedicated to expanding the use of thermal spray technologies for the benefit of industry and society. www.thermalspray.org

#### **Ipsen Inc.** Booth 936

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#### KamaticsRWG Booth 911

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#### Kermetico, Inc. Booth 1415

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#### Kittyhawk Products Booth 1016

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#### Lescav Booth 1233

#### Linde LLC Booth 1515

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For Aerospace aluminum brazing, this understanding is critical as most Nadcap inspectors require adherence to AMS 2750E, or a similar pyrometry specification, before granting consideration of your specific Aerospace-related processes. AMS 2750E is a pyrometry (temperature-driven) specification that employs procedures, timelines, calibration data, record archiving, System Accuracy Testing (SAT), Temperature Uniformity Surveys (TUS) and thermocouple guidelines and applications.

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**Booth 1014** 

#### LQ Material Technologies Co. Booth 1612

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#### Mesocoat Inc. Booth 1624 www.mesocoat.com

#### Metal Improvement Company Booth 824

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www.millidyne.fi

#### Montreal Carbide Booth 1530

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#### Nakayama Amorphous Booth 1513

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www.olympus-ims.com

#### **Oseir Oy** Booth 1410

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## Otto Trading, Inc.

**Booth 915** www.irestmassager.com

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www.praxairsurfacetechnologies.com

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Proto Manufacturing is a leading provider of portable and laboratory based x-ray diffraction systems and services including: X-ray diffraction residual stress measurement X-ray diffraction retained austenite Laue single crystal orientation systems Powder diffraction systems Custom x-ray diffraction systems Fine focus and micro focus x-ray tubes Electropolishers. *www.protoxrd.com* 

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ProjectSoft HK celebrates 25 years this year and has been active in automation and engineering mainly in food industry. Relationship with Institute of Plasma Physics in Prague resulted in advanced hybrid water plasma system of spraying WSP®-H500. The system has been designed to larger surfaces and is very cost effective.

www.projectsoft.cz

#### Proton OnSite Booth 1608

Proton OnSite is the world leader in on-site hydrogen generation, manufacturing and supplying the most advanced hydrogen generation systems available today. Our patented PEM electrolysis systems coupled with our uncompromising attention to excellence and quality enable us to deliver, install and support gas generation units in various material processing applications.

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#### ReliaCoat Technologies, LLC Booth 1619

ReliaCoat Technologies is introducing advanced process monitoring sensors, developing advanced software tools, and responding to existing and emerging needs in TS industries with scientifically-rooted solutions and innovations. The goal is to transfer advance concepts of monitoring TS coating properties with in-situ strategies to extract design-relevant properties within thermal spray booth. *www.reliacoat.com* 



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Ganzhou Achteck Tool Technology Co., Ltd is a wholly-owned subsidiary of Chonyyi Zhangyuan Tungsten Co., Ltd., located in Ganzhou of China with the registered capital 1.1 billion RMB. We provide the integrated supply chain related to tungsten products.

Imported 5 patents from USA, the company has established a high performance hard-facing materials production line with annual output 500 tons since 2008, which is widely used for surface strengthening. Based on patent technologies, more technical innovations have been achieved and the market share has been increasing rapidly in all over the world.

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Robo-Met.3D<sup>®</sup> efficiently provides scientists insights through visualization of materials structures in 3D. Process; grind, polish, etch, clean, optical microscopy, and image acquisition to your specifications. UES, Inc. a woman owned small business, 40 years of experience in scientific research and technology. Contact Tom Kielbaso tkielbaso@ues.com or (800) 627-5837 for information.

www.ues.com

#### Saint-Gobain Booth 1209

Saint-Gobain is a world class manufacturer of equipment, consumables and masking tapes for the thermal spray industry. We offer a complete line of ceramic powders, Rokide(R) rods, flexible cords, EBPVD ingots, tapes (HVOF and thermal spray), flame spray and plasma spray equipment. Come see our products at booth #1209.

www.coatingsolutions.saint-gobain.com www.chrtape.com

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#### Seram Coatings Booth 1539

Seram Coatings offer powder for thermal spray based on Silicon Carbide. Our coating provides excellent wear, abrasion and corrosion resistance for a range of applications.

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#### Sewon Hardfacing Co., Ltd. Booth 1532

Sewon Hardfacing's target is to be a most competitive and cost-effective thermal spraying powder supplier and coating service provider as well. Sewon's Yttria, YSZ and Al2O3 will be providing great satisfaction with High Flowability and High Purity and attractive cost. Please visit ITSC booth #1532 and www. sewon-hf.com for further information and any questions/inquiry to master@sewon-hf.com. *www.sewon-hf.com* 

#### Scientific Forming Technologies Corporation Booth 919

DEFORM<sup>™</sup> is a process and material modeling simulation system. DEFORM<sup>™</sup> models forging, extrusion, rolling, heat treatment, machining, and inertia welding processes. Microstructure evolution and property response can be predicted. Sensitivity analysis and Probabilistic modeling capabilities enables uncertainty quantification. DEFORM virtual process models leads to cost reduction and quality improvement. *www.deform.com* 

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#### Booth 1026

SECO/WARWICK provides advanced vacuum heat treatment equipment for annealing, brazing, sintering, gas quench, vacuum oil quench, LPC carburizing and pre-nitriding. Retech Systems LLC is leader in the supply of metallurgical processing equipment for melting, refining and casting reactive and refractory metals (titanium), super alloys and rare earth metals. *www.secowarwick.com* 

#### SEDS@UCSD Booth 728

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#### Solar Manufacturing Booth 831

#### St. Louis Metallizing **Booth 1637**

www.stlmetallizing.com

#### **Tapeworks and Machbloc(tm) Booth 1628**

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#### **Booth 1032**

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www.tecstress.com

#### Technogenia Lasercarb Oklahoma Inc. **Booth 1538**

www.technogeniaUSA.com

#### **TECNAR Automation Ltd. Booth 1215**

TECNAR is the world leader in the field of online sensors for the thermal/cold spray industry, for both R&D and shop floor monitoring. Our product portfolio includes the DPV eVOLUTION (THE reference in the research community), the Accurapsray-G3C, the Cold-SprayMeter, the ShotMeter and the SprayView. Contact us at thermalspray.sales@tecnar.com. www.tecnar.com

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#### **Transvalor Americas Corp** Booth 830

TRANSVALOR AMERICAS provides an extensive suite of high performance SIMULATION SOFTWARE that addresses a wide range of forming processes, for metallic solid and liquid materials as well as for polymers. "FORGE" for extensive hot or warm metal forming "COLDFORM" for cold metal forming and FASTENERS "REM3D" for plastic injection molding. www.transvalor.com

#### **Treibacher Industrie AG Booth 1514**

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www.treibacher.com

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UCT builds industry oriented thermal spray equipment. Systems can spray at high rates and produce high quality coatings, and need little maintenance. Products include advanced HVAF guns for both ID and OD applications, complete, turn-key spray systems, powder feeders, twin-wire arc guns, and accessories. They also offers thermal spraying services. www.uniquecoat.com

#### Verder Scientific, Inc. Booth 917

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#### VRSim, Inc. Booth 913

VRSim creates training systems designed to enhance basic skills training for industrial trades, and military and defense organizations. Using technology from the gaming industry with state of the art tracking systems and graphics rendering, VRSim produces training systems that are easy to use, fully-immersive, and provide a realistic learning environment. www.vrsim.com

#### Wall Colmonov Boooth 1331

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#### Westmoreland Mechanical Testing & Research, Inc. Booth 1014

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www.wmtr.com

#### White Engineering Surfaces Corporation Boooth 1638

www.whiteengineering.com

#### Zhengzhou Ruite Diamond Sand Belt Co., Ltd. Booth 1614

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#### Zhuzhou Jiangwu Boda Hard-Facing Materials Co.,Ltd Booth 1512

We offer customers cast tungsten carbide ,welding rod, thermal spray powder, macro tungsten powder ,crystalline tungsten powder, variety of carbide.With professional technical production, sales and management team and quality assurance system, the products are of high technological contact and mature technology, makes a wide range and stable market share abroad.

www.bodamaterials.com

#### ZL Diamond Technology Co.,Ltd. Booth 1332

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#### Game changing technology for the production of complex Titanium components



Norsk Titanium (NTi) is a Titanium component producer based in Norway that uses its novel game changing Direct Metal Deposition (DMD) technology to produce high quality, complex Titanium components for industrial applications.

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NTi's patented plasma arc based Direct Metal Deposition (DMD) technology is the first globally and commercially available technology of its kind. It enables large-scale, fully programmable means of achieving large and complex near net shape parts for industrial applications.

Traditionally, complex Titanium components are machined from milled or forged wrought raw material. This method has several drawbacks, such as long raw material lead times, significant machining time and cost, and a high degree of wastage of quality material. In addition, the traditional production methods have limitations with respect to design and shapes possible to produce.

Customer benefits include reduced price, shorter lead times, and increased design flexibility.

Our ambition is to provide reduced cost and production flexibility to existing users of Titanium components, as well as to make Titanium affordable for applications where traditional methods today make it impractical.

Norsk Titanium AS

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IMR Test Labs
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MTS Systems Corporation
NANOVEA

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ASB Industries, Inc
Castolin Eutectic
Flame Spray Technologies BV
Metallizing Equipment Co. Pvt. Ltd 1329
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#### **Testing Services/Equipment/Supplies**

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Materials Co., Ltd
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Sewon Hardfacing Co., Ltd
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Castolin Eutectic
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Metallisation Ltd
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Praxair Surface Technologies
Wall Colmonoy
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Thermach, Inc
Treibacher Industrie Ag

#### Wires

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Praxair Surface Technologies
Treibacher Industrie Ag
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