

Program

Surface Stability of Materials in High-Temperature Aggressive Environments

May 16-20, 2010

**The Lodge at Vail
Vail, Colorado, USA**

Conference Chairs

Prof. Brian Gleeson

Department of Mechanical Engineering & Materials Science, University of Pittsburgh

Prof. Dr. Michael Schütze

Karl-Winnacker-Institut, DECHEMA e.V., Germany

Prof. Toshio Maruyama

Tokyo Institute of Technology, Japan

Dr. Peter Tortorelli

Oak Ridge National Laboratory, USA



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Sunday, May 16, 2010

16:00 - 18:00	Registration (Cucina)
18:00 – 19:00	Reception (Cucina)
19:00 – 20:30	Dinner
20:30 – 20:45	Welcome and Announcements
20:45 – 21:45 <i>Plenary</i>	Superalloys: Past Successes and Future Challenges Ram Darolia, GE Aviation, USA (retired)

NOTES

- Technical Sessions will be held in International Room B.
- Poster Sessions will be held in International Room C.
- Meals will be held in International Room A, except for the Conference Banquet on Wednesday night which will be in the Cucina.
- Audiotaping, videotaping and photography of presentations are prohibited.
- Speakers – Please leave at least 5 minutes for questions and discussion.
- Please do not smoke at any conference functions.
- Turn your cellular telephones to vibrate or off during technical sessions.
- Be sure to make any corrections to your name/contact information on the Master Participant List or confirm that the listing is correct. A corrected copy will be sent to all participants after the conference.

Monday, May 17, 2010

07:00 – 08:00 Breakfast

Oral Session I: Basic Aspects - Materials

Session Chairs: Toshio Maruyama, Tokyo Institute of Technology, Japan

08:00 – 08:40 *Invited* **Forms of High-Temperature Surface Degradation**

Gerald H. Meier, University of Pittsburgh, USA

08:40 – 09:20 **Alloy Design for Resistance to High-Temperature Surface Degradation**

Brian Gleeson, University of Pittsburgh, USA

09:20 – 10:00 *Invited* **Reactive Element Effects**

Bruce Pint, Oak Ridge National Laboratory, USA

10:00 – 10:30 Coffee Break

10:30 – 11:00 **Composition Effects on Stable vs. Metastable Al₂O₃-Scale Formation**

Shigenari Hayashi, Hokkaido University, Japan

11:00 – 11:30 **Interaction Between High Temperature Corrosion Degradation and Mechanical Deformation for Ni-Based Alloys**

Sebastien Dryepondt, Oak Ridge National Laboratory, USA

11:30 – 13:00 Lunch

Oral Session II: Basic Aspects - Characterization

Session Chair: Peter Tortorelli, Oak Ridge National Laboratory, USA

13:00 – 13:40 *Invited* **The use of Advanced Surface Analysis Techniques in the Study of Transient Oxidation**

David Hovis, Case Western University, USA

13:40 – 14:20 **Measuring Oxygen Chemical Potentials on the Surface of Growing Scales During High-Temperature Oxidation of Metals and Alloys**

Toshio Maruyama, Tokyo Institute of Technology, Japan

Oral Session III: Basic Aspects and Applications

Session Chair: Peter Tortorelli, Oak Ridge National Laboratory, USA

14:20 – 15:00 *Invited* **Nuclear Power Systems – Mechanisms of Oxidation in Supercritical Water**

Todd Allen, University of Wisconsin, USA

15:00 – 15:40 *Invited* **Nuclear Power Systems – Gas Cooled**

Céline Cabet, Commissariat à l'énergie atomique (CEA), France

15:40– 16:00 Coffee Break

16:00 – 16:40 *Invited* **Advanced Steam Systems**

Tony Fry, National Physical Laboratory, UK

16:40 – 17:20 *Invited* **Fossil Energy Systems – Fireside**

David Alman, National Energy Technology Laboratory, USA

17:20 – 18:00 **Cast Alloys for Advanced Ultra Supercritical Steel Turbines**

Gordon Holcomb, National Energy Technology Laboratory, USA

19:00 – 20:30 Dinner

20:30 – 21:30 Poster Session and Social Hour

Tuesday, May 18, 2010

07:00 – 08:00 Breakfast

Oral Session IV: Applications I

Session Chair: Brian Gleeson, University of Pittsburgh, USA

08:00 – 08:40 *Invited* **Carbon Corrosion in the Chemical Process Industries**
David Young, University of New South Wales, Australia

08:40 – 09:10 **Advanced Materials Solutions for Metal Dusting Corrosion in Syngas Production**
Charlie Chun, ExxonMobil Research and Engineering Company, USA

09:10 – 10:50 *Invited* **High Temperature Corrosion Issues in Waste-to-Energy Plants**
Jan-Erik Svensson, Chalmers University of Technology, Sweden

10:50 – 11:15 Coffee Break

11:15 – 11:45 **Advanced Coating Technologies for Aggressive Corrosion Environments in Waste-to-Energy and Power Plants**
Yuuzou Kawahara, Dai-ichi High Frequency Company, Japan

11:45 – 12:25 *Invited* **Materials Degradation in Solid Oxide Fuel Cell (SOFC) Systems – From Bulk to Interfacial Reactions**
Prabhakar Singh, University of Connecticut, USA

12:25 – 14:00 Lunch

14:00 *ad hoc* Sessions / Free Time

Dinner on your own

Wednesday, May 19, 2010

07:00 – 08:00 Breakfast

Oral Session V: Applications II

Session Chair: David Shifler, Office of Naval Research, USA

08:00 – 08:40 *Invited* **Development of Thermally Grown Oxides in Emerging Alternative Fuel Combustion Environments**
Daniel Mumm, University of California at Irvine, USA

08:40 – 09:10 *Invited* **Corrosion Issues in Biomass Co-fired Power Plants**
Nigel Simms, Cranfield University, UK

09:10 – 09:40 **Reactions of Pure Chromium with Different Chlorides**
Juho Lehmusto, Åbo Akademi University, Finland

09:40 – 10:00 Coffee Break

Oral Session VI: Transitioning Research to Application

Session Chairs: Gerald Meier and Brian Gleeson, University of Pittsburgh, USA

10:00 – 10:40 **Testing Methods for Assessing High-Temperature Surface Degradation**
Michael Schütze, DECHEMA, Germany

10:40 – 11:20 *Invited* **Cyclic Oxidation Models and Life Prediction Strategies**
James Smialek, NASA, USA

11:30 – 13:00 Lunch

13:00 – 13:40 *Invited* **Material Issues in Oxyfuel Fired PC Boilers: *Thermodynamic Modeling, Lab-scale Corrosion Testing and First Validation from the Field***
Bettina Bordenet, Alstom, Switzerland

13:40 – 14:20 *Invited* **Thermal Protection Systems**
Donna Ballard, Air Force Research Laboratory, USA

14:20 – 14:50 **Extreme High Temperature Stability and Creep Resistance of Silicon Nitride Nanocomposite**
Amiya Mukherjee, University of California at Davis, USA

14:50 – 15:10 Coffee Break

15:10 – 16:00 *Invited* **Concept and Stability of Coating Systems**
Toshio Narita, Hokkaido University, Japan

16:00 – 16:30 **Microstructural Characterization of Electroplated Pt-Ir Coatings on Ni-Based Superalloys Follows by an Annealing Process**
Hideyuki Murakami, National Institute for Materials Science, Japan

16:30 – 18:30 **Poster Session** with coffee

19:00 – 20:00 Reception

20:00 – 22:00 Conference Banquet

Thursday, May 20, 2010

07:30 – 09:00 Breakfast

Session VII: Future Directions

Session Chair: Michael Schütze, DECHEMA, Germany

09:00 – 09:45 *Invited* **High-Temperature Materials Issues in Future Power Generation Systems**
Joe Quadackers, Forschungszentrum Jülich, Germany

09:45 – 10:30 **Integrating Recent Scientific Advances with Materials Developments for Surface-Degradation Resistance**
Peter Tortorelli, Oak Ridge National Laboratory, USA

10:30 – 11:00 Coffee Break

11:00 – 12:00 ***Roundtable Discussion on Future High-Temperature Systems and the Integration of Recent Scientific Advances***

12:00 Lunch and Departures

List of Posters

1. *STUDYING THE THERMAL STABILITY OF GAMMA TIAL INTERMETALLICS FOR INDUSTRIAL TURBINES*
Amirahmad Mohammadi and Maria Knutson Wedel, Chalmers University of Technology, Department of Materials and Manufacturing Technology, Sweden
2. *HYDROGEN PERMEABILITY IN N-TYPE CHROMIA SCALE AT 1273 K*
Minoru Tanaka, Mitsutoshi Ueda, Kennichi Kawamura, and Toshio Maruyama, Tokyo Institute of Technology, Japan
3. *OXIDATION BEHAVIOR OF ALUMINA-FORMING AUSTENITIC STEELS*
Kinga A. Unocic, Aurelie Vande Put, and Bruce A. Pint, Oak Ridge National Laboratory, USA
4. *MICROSTRUCTURES AND OXIDATION BEHAVIOR OF SPUTTER-DEPOSITED OVERLAY COATINGS BASED ON Cr-MODIFIED β -NiAl*
Mark L. Weaver, Michael A. Bestor, and Joel P. Alfano, The University of Alabama, USA
5. *DEVELOPMENT OF THE OXIDE SCALE DURING HIGH TEMPERATURE OXIDATION OF β -NiAl AND YTTRIUM-IMPLANTED β -NiAl AT 1100°C*
Jerzy Jedlinski, AGH University of Science and Technology, Poland; H.J. Choi, B. Yao, and Y. Sohn, APMAC, University of Central Florida, USA; K. Kowalski, A. Bernasik, M. Nocun, and J. Camra, AGH University of Science and Technology, Poland; G. Borchardt, Technical University Clausthal, Clausthal-Zellerfeld, Germany; M. Konopka, now: WS Atkins-Polska, Warszawa, Poland
6. *FILTERED ARC AND HYBRID PVD MATERIALS FOR SOFC AND RELATED APPLICATIONS*
Paul Gannon, Montana State University, USA
7. *CHROMIUM EVAPORATION AND CORROSION OF DIFFERENT COATED AND UNCOATED INTERCONNECT MATERIALS*
Jan Froitzheim, Hamed Ravash, Lars Gunnar Johansson, and Jan Erik Svensson, Chalmers University of Technology, Sweden
8. *OPTIMIZED SURFACE MICROSTRUCTURAL DESIGN OF OXIDE SCALES ON FECRAL ALLOY FIBER MATS IN DIESEL PARTICULATE FILTER SYSTEMS*
Vladimir Shemet, D. Naumenko, W.J. Quadackers, and L. Singheiser, Forschungszentrum Jülich, Institute for Materials and Processes in Energy Systems, Germany; T. Härig, P. Hirth, and S. Dehning, Emitec GmbH, Germany
9. *EVOLUTION OF THERMALLY GROWN OXIDE ON TBC BOND COAT MATERIALS IN VARIABLE SIMULATED COMBUSTION ENVIRONMENTS*
Matthew H. Sullivan, Daniel R. Mumm, and Matthew D. Weeks, University of California at Irvine, Dept. Materials Science & Engineering, USA
10. *EFFECT OF Pt AND MANUFACTURING PROCESS ON THE OXIDATION BEHAVIOR OF A NiCoCrAlYTa BOND COATING FOR TBC SYSTEMS APPLICATIONS*
Aurélie Vande Put*, Djar Oquab, and Daniel Monceau, Institut Carnot CIRIMAT, ENSIACET, France; Eve Pere, Université de Pau et des Pays de l'Adour, IPREM, France; Aymeric Raffaitin, TURBOMECA, France. * Now at ORNL, USA
11. *EFFECT OF Hf AND Cr ADDITIONS ON THE SHORT-TERM ISOTHERMAL OXIDATION PERFORMANCE OF SPUTTER DEPOSITED β -NiAl BOND COATS ON Ni-BASED SUPERALLOYS*
Michael A. Bestor*, Joel P. Alfano, and Mark L. Weaver, The University of Alabama, Department of Metallurgical and Materials Engineering, USA. * Now at ORNL, USA

12. *THE EFFECT OF PHASE CONSTITUTION ON THE HOT CORROSION BEHAVIOR OF NiCrAlY ALLOYS*
Michael N. Task, B. Gleeson, F.S. Pettit, and G.H. Meier, University of Pittsburgh, Dept. Mechanical Engineering & Materials Science USA

13. *THICK HIGH-PURITY LOW-DENSITY APS THERMAL BARRIER COATINGS*
Michael A. Helminiak, N.M. Yanar, F.S. Pettit, and G.H. Meier, University of Pittsburgh, Dept. Mechanical Engineering & Materials Science, USA; T.A. Taylor, Praxair Surface Technologies (Retired), USA.