Preliminary Program

Thermal and Environmental Barrier Coatings

August 17-22\textsuperscript{nd}, 2003

Kloster Irsee/ Swabian Conference Center
Irsee, Germany

Conference Chairs

David R. Clarke
Anthony Evans
Manfred Ruehle
The conference chairs and organizers would like to thank the following for their generous support of this conference:

  Air Force Office for Scientific Research
  Office of Naval Research
  Office of Naval Research International Office
Sunday, 17th August 2003

16:30 – 18:30  Registration
18:30 – 20:00  Dinner
21:00 – 23:00  Opening Reception (Bierstube)

Monday, 18th August 2003

Session I: Introductory Session

07:00 – 08:30  Breakfast
08:45 – 09:00  Welcome
09:00 – 09:35  Michael Maloney, Pratt and Whitney
Historical Development of Thermal Barrier Coatings
09:35 – 10:10  Ram Darolia, GE Aerospace
Industrial Perspective of TBCs for Aerospace
10:10 – 10:40  Coffee Break
10:40 – 11:15  Matthias Oechsner, Siemens Power Systems
Industrial Perspective of TBCs for Power Generation
11:15 – 12:00  Anthony Evans, University of California, Santa Barbara
TBCs as Interacting Multilayer Systems
12:00 – 13:30  Lunch

Session II: Oxidation Issues

13:30 – 14:05  W. J. Quaddakers, Julich
Oxidation of MCrAl Bond Coats
14:05 – 14:40  Bruce Pint, Oak Ridge National Laboratory
Oxidation of PtNiAl Aluminides
14:40 – 15:10  Gerry Meier, University of Pittsburgh
Growth Strain Accompanying Oxidation
15:10 – 15:30  Afternoon Coffee Break
15:30 – 16:05  David Srolovitz, Princeton University
Stress Development During Growth of Oxide Scales
Monday, 18th August 2003 (continued)

16:05 – 17:30  **Round-Table Discussion on Oxidation Stresses**

18:30 – 20:00  **Dinner**

20:00 – 21:00  **Discussion: Future needs in understanding oxidation stresses**

21:00 – 22:00  **Social Hour (Bierstube)**

Tuesday, 19th August 2003

07:00 – 08:15  **Breakfast**

**Session III: Mechanical Properties of TBC Systems**

08:30 – 09:05  Joachim Roesler, Technical University of Braunschweig  
**Modeling TBC System Stresses and Failure**

09:05 – 09:40  Bill Clyne, University of Cambridge  
**Microstructural and Property Changes in the Top Coat of Plasma-Sprayed Coatings During Service**

09:40 – 10:15  Kevin Hemker, John Hopkins University  
**Bond Coat Mechanical Properties and Microstructural Evolution**

10:15 – 10:45  **Coffee Break**

10:45 – 11:20  Daniel Balint, Harvard University  
**Modeling of Oxide Undulation Growth**

11:20 – 11:55  Alan Cocks, Leicester University  
**Pegging Phenomena**

12:00 – 13:30  **Lunch**

13:30 – 16:30  **Round-Table Discussion on Mechanical Properties, Rumpling and Oxidation-Induced Instabilities**

18:30 – 20:00  **Dinner**
Tuesday, 19th August 2003 (continued)

Session IV: TBC Deposition Methods

20:00 – 20:35 Nitin Padture, University of Connecticut
Solution Precursor Plasma Spray for depositing TBCs

20:35 – 21:10 David Wortman, General Electric Global Research Center
Electron Beam Deposition of TBCs

21:10 – 22:30 Round Table Discussion and Social hour

Wednesday, 20th August 2003

07:00 – 08:15 Breakfast

Session V: Thermal Conductivity Measurements and Models

08:30 – 09:05 Daniele Fournier, CNRS
Photothermal Experimental Techniques: Application to TBCs

09:05 – 09:40 Ted Bennett, University of California, Santa Barbara
In-situ Thermal Conductivity Measurements of Coatings

09:40 – 10:15 Dongming Zhu, NASA Glenn Research Center
Measuring Thermal Conductivity at High Temperatures

10:15 – 10:45 Coffee Break

10:45 – 11:20 David Cahill, University of Illinois, Urbana
Heat Transport by Lattice Vibrations: Disorder and Interfaces

11:20 – 11:55 Simon Phillpott, Argonne National Laboratory
Multiscale Simulation of Thermal Transport

12:00 – 14:00 Lunch

14:00 – 15:30 Round Table Discussions on Thermal Conductivity Issues

15:30 – 16:00 Poster Session: Recent Developments
Brief presentations by authors

16:00 –18:30 Poster Session with refreshments

18:30 – 20:00 Dinner
Wednesday, 20th August 2003 (continued)

20:00 – 22:00 Poster session (continued)/ social hour

Thursday, 21st August 2003

07:00 – 08:30 Breakfast

Session VI: Diffusion and Phase Stability

08:45 – 09:20 J.-C. Zhao, General Electric Global Research Center
Efficient Exploration of Diffusion Multiples for Coating Design

09:20 – 09:55 Tresa Pollock, University of Michigan
Ruthenium-Modified Bond Coats for Thermal Barrier Systems

09:55 – 10:30 Carlos Levi, University of California, Santa Barbara
Phase Stability Studies for Thermal Barrier Systems

10:30 – 11:00 Coffee Break

11:00 – 12:00 Roundtable Discussion: Inter-diffusion and Phase Stability Issues

12:00 – 13:30 Lunch

Session VII: Non-Destructive Evaluation and Future Coatings

13:30 – 14:05 Alan Atkinson, Imperial College, London
Piezo-spectroscopy Studies of TGO Stress and Damage Evolution

14:05 – 14:40 Ping Xiao, University of Manchester
Impedance Spectroscopy of TBCs

14:40 – 15:15 Maria Arana Antello, ALSTROM, Switzerland
Geometrical and Loading Conditions Affecting TBC Failure

15:15 – 15:30 Coffee Break

15:30 – 16:05 Joerg Feist, Southside Thermal Sciences
Designing “Smart” TBCs: Rare-Earth Activated Materials

16:05 – 16:40 Wolfgang Pompe, Technical University of Dresden
TBCs for Novel Applications
Thursday, 21st August 2003 (continued)

16:45 – 18:00  Roundtable Discussions on NDE and Lifetime Predictions
18:00 – 19:00  Organ Recital
19:00 – 22:00  Conference Banquet and Social Hour

Friday, 22nd August 2003

07:00 – 08:15  Breakfast
08:30 – 10:30  Late Breaking Developments and Additional Discussions
10:30 – 11:00  Coffee Break and Departures
POSTER CONTRIBUTIONS

Bernd Baufeld, German Aerospace Center (DLR), Germany
Influence of Bond-Coat Rumpling on Evolution of Delamination Cracks

Eric Jordan, University of Connecticut
Measurement of Oxide Stress and Associated Failure Modes

Reita Valerie, University Pierre et Marir Curie
Thermal Characterization of New Generation Coatings by “Mirage” Effect

Takashi Goto, Institute for Metals Research, Tohoku University
High-Speed Deposition of YSZ Coatings by Laser CVD

Shunkichi Ueno, National Institute of Advanced Industrial Science and Technology
High temperature Water Vapor Corrosion Resistance of Silicon Nitride with Lu-Si-O EBC

Matvei Zinkevich, Max Planck Institut fur Metallforschung, Stuttgart
Computational Phase Studies

Franziska Traeger, Forschungszentrum, Julich
Fracture Mechanical Model for the Life-Time Evaluation of Plasma-Sprayed TBCs

Doni Jayaseelan, Synergy Materials Research Center, AIST
Development of New Candidate EBC Materials

Xijia Wu, Institute for Aerospace Research, National Research Council, Canada
Microstructural Damage Evolution in a Plasma Sprayed TBC

Gilles Cardosi, ONERA
Stress State in an EB-PVD Thermal Barrier Coating

Yasuo Matsunaga, Japan Fine Ceramics Center
Oxidation Behavior of Bond Coatings for EB-PVD TBCs

Mineaki Matsumoto, Japan Fine Ceramics Center
EB-PVD TBC with Low Thermal Conductivity and High-temperature Stability

John Nychka, University of California, Santa Barbara
Quantifying Cation Grain Boundary Diffusion in Thermally Grown Alumina

Shuqi Guo, Shijie Zhu and Yutaka Kagawa, Institute of Industrial Science, U. Tokyo
Effect of Loading Rate and Hold Time on Hardness and Young’s Modulus of EB-PVD Thermal Barrier Coatings
Toru Tomimatsu, Shijie Zhu and Yutaka Kagawa, Institute of Industrial Science, The University of Tokyo,

**Local Stress Distribution in Thermally Grown Oxide Layers of EB-PVD Thermal Barrier Coatings**