SYMPOSIUM HH

High-Temperature Thermal Spray Coatings—Thermal Barrier Coatings

December 2 – 3, 2002

Chairs
Y. C. Lau
General Electric Global Research Center
Joachim Heberlein
Univ of Minnesota
Christian Moreau
Nat Research Council Canada
Montia Nestler
Sulzer Metco Inc

Symposium Support
General Electric Global Research Center
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*Invited paper

SESSION HH1: PROCESS OPTIMIZATION AND CONTROL

Chairs: Christian Moreau and Curtis A. Johnson
Monday Morning, December 2, 2002
Independence East (Sheraton)

8:30 AM *HH1.1
PLASMA SPRAYING OF LIQUID PRECURSORS TO OBTAIN NONSTRUCTURED COATINGS. P. Fauchais, J.F. Coutard, J. Puisieux, Laboratoire Sciences des Procédés Céramiques et Traitments de Surface, UMR-CNRS 6638, Université de Limoges, Limoges, FRANCE, L. Biichi, Commissariat Energie Atomique, Le Ripuy, Monts, FRANCE.

9:00 AM *HH1.2
TWIN-HYBRID PLASMA SPRAY SYSTEM FOR THERMAL BARRIER COATINGS. Takeshi Yoshino, Department of Materials Engineering, The University of Tokyo, Tokyo, JAPAN.

9:30 AM *HH1.3
DEVELOPMENT POTENTIAL OF EXISTING THERMAL BARRIER MATERIALS. Andrew R. Nicoll, Global Materials, Sulzer Metco (US) Inc., Westbury, NY.

10:00 AM BREAK

10:30 AM HH1.4
FORMATION OF THERMAL BARRIER COATINGS IN SOLUTION PRECURSOR PLASMA SPRAY PROCESS. Liangxi Xie, University of Connecticut, Dept of Metallurgy and Materials Engineering, Storrs, CT; Xinqin Ma, InfraMat Corp., Farmington, CT; Alper Ozturk, University of Connecticut, Dept of Mechanical Engineering, Storrs, CT; Eric H. Jordan, University of Connecticut, Dept of Mechanical Engineering, Storrs, CT; Nitin P. Padture, University of Connecticut, Dept of Mechanical Engineering, Storrs, CT; Baki M. Celtegen, University of Connecticut, Dept of Mechanical Engineering, Storrs, CT; Maurice Gell, University of Connecticut, Dept of Metallurgy and Materials Engineering, Storrs, CT.

10:45 AM HH1.5

11:00 AM HH1.6
PLASMA SPRAY DEPOSITION OF ALUMINUM OXIDE USING SOL- GEL FEEDSTOCK. N. Bahlawane, B. Alkaawi, K. Kohls-Honingham Physical Chemistry, Bielefeld University, Bielefeld, GERMANY; Institute of Combustion and Gasdynamics, Gerhard-Mercator-Universität Duesseldorf, Duesseldorf, GERMANY.

11:15 AM HH1.7
ENGINEERING PLASMA SPRAYED COATING MICROSTRUCTURE BY ADVANCED CONTROL. S.N. Bao, G. Ye, C. Cui, M. Gevelber, W. Wróblewski, College of Engineering, Boston University, Boston, MA; J.R. Finkle, W.D. Swink, Idaho National Engineering and Environmental Laboratory, Idaho Falls, ID.

11:30 AM HH1.8
PROCESS TECHNIQUE FOR PREDICTING PLASMA SPRAY COATING THICKNESS. H.P. Wang, H. W. Ng, Eric M. Perry, A. Devineni, Michael C. Ostrowski, GE Global Research, Niskayuna, NY; "Nanyang Technological University, School of Mechanical and Production Engineering, SINGAPORE.

11:45 AM HH1.9
SPLAT'S FORMATION OF THERMALLY SPRAYED MOLYBDENUM AND ZIRCONIA: A CONTRIBUTION TO MAP STUDY. Li Li, Anirudha Vaidya, Sunjay Sampath, State University of New York at Stony Brook, Dept of Materials Science and Engineering, Stony Brook, NY; Hui Zhang, State University of New York at Stony Brook, Dept of Mechanical Engineering, Stony Brook, NY; Xiaoyang Jing, Caterpillar Inc., Peoria, IL.

SESSION HH2: DEGRADATION AND FAILURE MECHANISMS, LIFE PREDICTION

Chairs: Y. C. Lau and Herbert Herman
Monday Afternoon, December 2, 2002
Independence East (Sheraton)

1:30 PM *HH2.1
DESIGNING THE MATERIAL PROPERTIES OF NANOSTRUCTURED ZIRCONIA-BASED DEPOSITS. Chris Bernhardt, Stony Brook University, Materials Science and Engineering, Stony Brook, NY; Ahmet Kucuk, Karl Storz Endovision, Charlton, MA; Regerio Lima, National Research Council Canada, Boucherville, CANADA.

2:00 PM *HH2.2
TBC FAILURE MECHANISMS FROM DEPOSITS OF AIRBORNE CONTAMINATES. Curtis A. Johnson, General Electric Global Research, Ceramic and Metallurgy Technologies, Selden, NY.

2:30 PM HH2.3
FAILURE MECHANISMS OF DENSE VERTICALLY CRACKED THERMAL BARRIER COATINGS AT THREE DIFFERENT TEMPERATURES. Minshu Madiwal, Maurice Gell, University of Connecticut, Institute of Materials Science, Storrs, CT; Eric Jordan, University of Connecticut, Dept of Mechanical Engineering, Storrs, CT.

2:45 PM HH2.4
EFFECTS OF THERMAL CYCLING ON THE PROPAGATION OF DELAMINATION CRACKS IN THERMAL BARRIER SYSTEMS. Ming Y. He, Tao Xu, A.G. Evans, Materials Department, University of California, Santa Barbara, CA.

3:00 PM BREAK

3:30 PM HH2.5
DEGRADATION OF APS-SYSZ THERMAL BARRIER COATINGS ON ALPHA-ALUMINA MODIFIED BOND COATS DURING HIGH TEMPERATURE EXPOSURE. Mohammed Chughtai, Gordon Kidd, SIFCO Turbine Components Ltd, Carrigtwohill, Cork, IRELAND; Michael Auger, Icscod AG, Olten, SWITZERLAND.

3:45 PM HH2.6
DAMAGE AND OXIDE STRESS EVOLUTION AS A FUNCTION OF TEMPERATURE, TIME, AND CYCLES IN TBCs. Swetha Sridharan, Eric Jordan, Univ of Connecticut, Dept of Mechanical Engineering, Storrs, CT; Maurice Gell, Univ of Connecticut, Dept of Metallurgy and Materials Engineering, Storrs, CT.

4:00 PM HH2.7
Abstract Withdrawn

SESSION HH3: IN-ROOM POSTER SESSION

Chairs: Y. C. Lau and Herbert Herman
Monday, December 2, 2002
Independence East (Sheraton)

HH3.1
LASER SURFACE TREATMENT OF THERMAL BARRIER COATINGS. Ricardo M. Ribeiro, Vasco Teixeira, A. Portinho, Departamento de Fisica, Universidade do Minho, Braga, PORTUGAL; Carlos Oliveira, IDIT, Santa Maria da Feira, PORTUGAL.
HH3.2
HIGH-TEMPERATURE XRD RESIDUAL STRAIN
MEASUREMENTS IN ALUMINA SCALE. Thomas L. Watkins, O. Burl Cain, Jimming Bai, Oak Ridge National Laboratory, Metals and Ceramics Division, Oak Ridge, TN.

HH3.3
MICROSTRUCTURAL CHARACTERIZATION OF THE TGO IN AN EB-PVD ZrO2-BASE TBC ON A Ni-BASE SUPERALLLOY TURBINE BLADE AFTER ACTUAL SERVICE USE. Li-dao Zhang and Arthur H. Heuer, Case Western Reserve University, Department of Materials Science and Engineering, Cleveland, OH.

SESSION HH4: STRUCTURE/PROPERTY RELATIONSHIPS
Chair: Monta Nestler and Pierre Fanchais
Tuesday Morning, December 3, 2002 Independence East (Sheraton)

8:30 AM #HH4.1
PREDICTING THERMAL PROPERTIES FROM MICROSTRUCTURES. Edwin R. Fuller Jr., National Institute of Standards and Technology, Gaithersburg, MD; James Raud, N.S. Huri, James C. Grande, Antonio Mogro-Campero, GE Corporate Research and Development, Schenectady, NY.

9:00 AM #HH4.2
MICROSTRUCTURE-PERFORMANCE RELATIONSHIPS FOR AIR PLASMA SPRAYED THERMAL BARRIER COATINGS. James Raud, GE Global Research, Niskayuna, NY.

9:30 AM HH4.3
VOID MORPHOLOGY OF THERMALLY SPRAYED NiCAlY DEPOSITS IN RELATION TO THERMAL AND ELECTRICAL CONDUCTIVITY. Thomas Keller, Werner Wagner, Paul Scherrer Institut, Villigen, SWITZERLAND; Nikolaus Morgenstern, Stephan Siegmans, EMPA Swiss Federal Laboratories for Materials Testing and Research, Thun, Switzerland; Anand Kulkarni, SUNY at Stony Brook, Stony Brook, NY.

9:45 AM HH4.4

10:00 AM BREAK

10:30 AM HH4.5
AN ANALYSIS OF EVOLUTION OF STRESS-STATES IN FUNCTIONALLY GRADED MATERIALS USING VORONOI ELEMENTS. S.B. Bizer, Ames Laboratory, Iowa State University, Ames, IA.

10:45 AM HH4.6
BOND COAT SURFACE RUPTURING IN THERMAL BARRIER COATINGS. Rajal Peraz, Sohn Zheng, K. Jaymes Han, Dept of Theoretical and Applied Mechanics, University of Illinois Urbana, IL.

11:00 AM HH4.7
HIGH-TEMPERATURE COATING LAYER DESIGN FOR Mg-Si-B ALLOY. J.S. Park, R. Sakidja, J.H. Perepezko, University of Wisconsin-Madison, Dept of Materials Science & Engineering, Madison, WI; J. Fournelle, University of Wisconsin-Madison, Dept of Geology and Geophysics, Madison, WI.

11:15 AM HH4.8
PLASMA SPRAYED DEPOSITION OF AL-Ti-Cr COATING FOR OXIDATION PROTECTION OF TAI ALLOYS. J.K. Lee, D.M. Wee, Department of Materials Science and Engineering, KAIST, Daejeon, KOREA; M.H. Oh, Department of Materials Science and Engineering, KNUT, Gumi, KOREA; W.J. Quadlikers, Forschungszentrum Jülich, Jülich, Germany; H.K. Lee, Dept of Materials and Production Engineering, Hankuk National Univ, Daejeon, KOREA.

1:30 PM #HH5.1
PORE STRUCTURE OF THERMAL BARRIER COATINGS. Herbert Herman, Anand Kulkarni and Sanjay Sampath, Center for Thermal Spray Research, SUNY-Stony Brook, Stony Brook, NY.

2:00 PM HH5.2
A REVIEW OF RECENT ADVANCES IN TBC MICROSTRUCTURE CHARACTERIZATION BY NEUTRON AND X-RAY SCATTERING. Andrew Allen, Tabetha Dobkins, Gabrielle Long, NIST, Gaithersburg, MD; Jan Hasky, University of Maryland, College Park, MD; Anand Kulkarni, Herbert Herman, SUNY, Stony Brook, NY; Allen Gohard, Brookhaven National Laboratory, Upton, NY.

2:15 PM HH5.3
USE OF X-RAY TOMOGRAPHY FOR CHARACTERIZATION OF THERMALLY SPRAYED AND ELECTRON-BEAM PHYSICALLY VAPOR DEPOSITED THERMAL BARRIER DEPOSITS. Jean Hasky, Tabetha Dobkins, Gabrielle Long, NIST, Gaithersburg, MD; Anand Kulkarni, Herbert Herman, SUNY, Stony Brook, NY; Francesco DeCarlo, ANL, Argonne, IL.

2:30 PM HH5.4
APPLICATION OF IMAGE ANALYSIS FOR CHARACTERIZATION OF POROSITY IN THERMAL SPRAY COATINGS AND CORRELATION WITH SMALL ANGLE NEUTRON SCATTERING. Swarnima Deshpande, Anand Kulkarni, Anuradha Vidyasagar, Sanjay Sampath, Herbert Herman, State University of New York at Stony Brook, Dept. of Materials Science and Engineering, Stony Brook, NY.

2:45 PM HH5.5
THE APPLICATION OF NEW GENERATION TEM SPECIMEN PREPARATION METHODS TO HYPO THERMALLY SPRAYED COATINGS. Goonong Kong, P.D. Brown, D.G. McCartney, University of Nottingham, School of Mechanical, Materials, Manufacturing Engineering and Management, Nottingham, UNITED KINGDOM.

3:00 PM BREAK

3:30 PM HH5.6
ASSESSMENT OF DAMAGE EVOLUTION IN THERMAL BARRIER COATING USING A NDE TECHNIQUE – THERMAL WAVE IMAGING. Gohum News, Wayne State University, Dept. of Mechanical Engineering and Institute of Materials Research, Detroit, MI.

3:45 PM HH5.7
NON-DESTRUCTIVE EVALUATION OF CRACK FORMATION IN THERMAL BARRIER COATINGS USING IMPEDANCE SPECTROSCOPY. Md Shamez Ali, Brunel University, Dept. of Mechanical Engineering, Uxbridge, UNITED KINGDOM; Ping Xiong, Manchester Materials Science Centre, University of Manchester, Manchester, UNITED KINGDOM.

4:00 PM HH5.8
ELASTIC MODULUS OF THERMAL BARRIER COATINGS EVALUATED BY INDENTATION – RELATIONSHIP BETWEEN THE PROCESSING AND MICROSTRUCTURE. Lubor Pekdik, Anand Kulkarni, Sanjay Sampath, Herbert Herman, Dept of Materials Science and Engineering, State University of New York, Stony Brook, NY.

4:15 PM HH5.9
A METHOD TO MEASURE RADIATIVE PROPERTIES OF THERMAL BARRIER COATINGS. Ted D. Bennett, Dept. of Mechanical and Environmental Engineering, University of California, Santa Barbara, CA.

4:30 PM HH5.10
CHARACTERIZATION OF THERMAL BARRIER COATINGS PRODUCED USING SOLUTION PRECURSOR PLASMA SPRAY PROCESS. Liangxi Xia, University of Connecticut, Dept of Metallurgy and Materials Engineering, Storrs, CT; Xiaojin Ma, Infranum Corp, Farmington, CT; Eric H. Jordan, University of Connecticut, Dept of Mechanical Engineering, Storrs, CT; Nitin P. Patil, University of Connecticut, Dept of Metallurgy and Materials Engineering, Storrs, CT; Maurice Gell, University of Connecticut, Dept of Metallurgy and Materials Engineering, Storrs, CT.

SESSION HH5: COATING OPTIMIZATION AND CHARACTERIZATION
Chair: Joachim Heberlein and James A. Raud
Tuesday Afternoon, December 3, 2002 Independence East (Sheraton)