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**CHARLES J. MCMAHON INTERFACIAL SEGREGATION AND  
EMBRITTELEMENT SYMPOSIUM**

**AFOSR: F49620-02-1-0064**

The symposium took place during the annual meeting of TMS in Seattle, Washington, February 18–February 21, 2002. The program of the symposium is enclosed with this report.

The support provided by this grant was used to cover travel and subsistence of the following invited foreign speakers.

Professor John F. Knott, Department of Materials Science and Engineering, Birmingham University, England (\$1,119).

Professor David Embury, Department of Materials Science and Engineering, McMaster University, Hamilton, Canada (\$395)

Professor Manfred Ruhle, Max-Planck-Institut für Metalforschung, Stuttgart, Germany (\$603)

Dr. Wilfried Sigle, Max-Planck-Institut für Metalforschung, Stuttgart, Germany (\$768)

Dr. Pavel Lejcek, Institute of Physics, Academy of Sciences of the Czech Republic, Prague, Czech Republic (\$1,079)

Dr. Christian Elsaesser, Fraunhofer Institute, Freiburg, Germany (\$1,036)

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## **Charles J. McMahon Interfacial Segregation and Embrittlement Symposium: Grain Boundary Segregation and Fracture in Steels**

*Sponsored by:* ASM International: Materials Science Critical Technology Sector, Structural Materials Division, Materials Processing & Manufacturing Division, Jt. Mechanical Behavior of Materials, Jt. Computational Materials Science & Engineering, Texture & Anisotropy Committee

*Program Organizers:* Vaclav Vitek, University of Pennsylvania, Department of Materials Science and Engineering, Philadelphia, PA 19104 USA; Clyde Briant, Brown University, Division of Engineering, Providence, RI 02912 USA; Harvey D. Solomon, General Electric Company, Research & Development Center, Schenectady, NY 12309 USA

Monday PM      Room: 307-308  
February 18, 2002      Location: Washington State Convention & Trade Center

*Session Chairs:* Clyde Briant, Brown University, Div. of Eng., Providence, RI 02912 USA; Vasek Vitek, University of Pennsylvania, Dept. of Matls. Sci. & Eng., Philadelphia, PA 19104 USA

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### **2:00 PM Keynote**

**Embrittlement Phenomena: Where Have We Been, and Where Are We Going?:** *Charles J. McMahon*<sup>1</sup>; <sup>1</sup>University of Pennsylvania, Dept. of Matls. Sci. & Eng., 3231 Walnut St., Philadelphia, PA 19104 USA

### **2:35 PM Invited**

**Industrial Experiences in Relation to Intergranular Cohesion of Steels:** *Hiroo Ohtani*<sup>1</sup>; *Masaaki Igarashi*<sup>1</sup>; <sup>1</sup>Sumitomo Metal Industries, Ltd., Corp. Rsrch. Labs., 1-8 Fuso-cho, Amagasaki, Hyogo 660-0891 Japan

### **3:10 PM Invited**

**Segregation Intergranular Fracture and Limits to Formability in Re-Phosphorised Steels:** *David Embury*<sup>1</sup>; *Kevin Boyle*<sup>1</sup>; <sup>1</sup>McMaster University, Dept. of Matls. Sci. & Eng., 1280 Main St. W., Hamilton, Ontario L8S 4L7 Canada

### **3:45 PM Invited**

**Effects of Impurity-Element Segregation on Fracture Toughness and Fatigue-Crack Propagation in a 2.25Cr1Mo Steel:** *John Frederick Knott*<sup>1</sup>; *Aminul Islam*<sup>1</sup>; *Paul Bowen*<sup>1</sup>; <sup>1</sup>The University of Birmingham, Sch. of Eng., Elms Rd., Birmingham, Edgbaston B15 2TT UK

### **4:20 PM**

**Quench Embrittlement: A Recently Recognized Mechanism of Intergranular Embrittlement in As-Quenched High-Carbon Steels:** *George Krauss*<sup>1</sup>; *David K. Matlock*<sup>1</sup>; <sup>1</sup>Colorado School of Mines, Adv. Steel Rsrch. Ctr., Golden, CO 80401 USA

### **4:40 PM**

**Anomalous Fracture Behavior of AISI 4340 Steels Treated at Different Solution Annealing Temperatures:** *Jaroslav Pokluda*<sup>1</sup>; <sup>1</sup>Brno University of Technology, Inst. of Physl. Eng., Technicka 2, Brno CZ-616 69 Czech Republic

### **5:00 PM**

**Boronizing on Impurity Controlled Steels:** *C. Bindal*<sup>2</sup>; *A. H. Ucisik*<sup>1</sup>; <sup>1</sup>Sakarya University, Dept. of Metall. & Matls. Eng., Adapazari-Sakarya Turkey; <sup>2</sup>Bogazici University, Dept. of Matls. Inst. of Biomed. Eng., Saribal S. 40, Ortakoy-Istanbul 80840 Turkey

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## **Charles J. McMahon Interfacial Segregation and Embrittlement Symposium: Theory of Segregation and Fracture**

*Sponsored by:* ASM International: Materials Science Critical Technology Sector, Structural Materials Division, Materials Processing & Manufacturing Division, Jt. Mechanical Behavior of Materials, Jt. Computational Materials Science & Engineering, Texture & Anisotropy Committee

*Program Organizers:* Vaclav Vitek, University of Pennsylvania, Department of Materials Science and Engineering, Philadelphia, PA 19104 USA; Clyde Briant, Brown University, Division of Engineering, Providence, RI 02912 USA; Harvey D. Solomon, General Electric Company, Research & Development Center, Schenectady, NY 12309 USA

Tuesday AM      Room: 307-308  
February 19, 2002      Location: Washington State Convention & Trade Center

*Session Chairs:* David N. Seidman, Northwestern University, Dept. of Matls. Sci. & Eng., Evanston, IL USA; Pavel Lejcek, Academy of Sciences of the Czech Republic, Inst. of Phys., Prague Czech Republic

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### **8:30 AM Invited**

**Computational Materials Science Approach to Interfacial Segregation and Embrittlement:** *Arthur J. Freeman*<sup>1</sup>; <sup>1</sup>Northwestern University, Dept. of Phys. & Astron., 2145 N. Sheridan Rd., Evanston, IL 60208 USA

### **9:05 AM Invited**

**Interfacial Adhesion and Structure of Grain Boundaries in bcc Transition Metals with Segregated Interstitial Impurities:** *Christian Elsässer*<sup>1</sup>; Rebecca Janisch<sup>1</sup>; Thorsten Ochs<sup>1</sup>; <sup>1</sup>Max-Planck-Institut für Metallforschung, Seestr. 92, C-70174, Stuttgart Germany

### **9:40 AM Invited**

**Impurity-Induced Decohesion:** *John L. Bassani*<sup>1</sup>; <sup>1</sup>University of Pennsylvania, Mechl. Eng. & Appl. Mech., 297 Towne Bldg., 220 S. 33rd. St., Philadelphia, PA 19104-6315 USA

### **10:15 AM**

**Brittle Fracture and the Breaking of Atomic Bonds:** *Peter Gumbsch*<sup>1</sup>; <sup>1</sup>Max-Planck-Institut für Metallforschung, Seestrasse 92, 70174 Stuttgart Germany

### **10:35 AM**

**A Universal Mechanism of Brittle Compressive Failure:** *Erland M. Schulson*<sup>1</sup>; Carl E. Renshaw<sup>1</sup>; <sup>1</sup>Thayer School of Engineering, Dartmouth College, Hanover, NH 03755 USA

### **10:55 AM**

**Segregation of Phosphorus Atoms to Grain Boundaries in Ferritic Steels under Neutron Irradiation:** *Alexander V. Barashev*<sup>1</sup>; Yury N. Osetsky<sup>1</sup>; David J. Bacon<sup>1</sup>; <sup>1</sup>The University of Liverpool, Dept. of Eng., Matls. Sci. & Eng., Liverpool L69 3GH UK

### **11:15 AM**

**Interaction of Grain Boundaries with Point Defects in fcc Metals:** *Akira Suzuki*<sup>1</sup>; Yuri Mishin<sup>1</sup>; <sup>1</sup>George Mason University, Sch. of Computl. Scis., 4400 University Dr., MSN 5C3, Fairfax, VA 22030 USA

### **11:35 AM**

**Atomistic Simulations of Segregation of Alloying Elements to a Grain Boundary in bcc Fe:** *Diana Farkas*<sup>1</sup>; Renata N. Nogueira<sup>2</sup>; Margarita Ruda<sup>3</sup>; <sup>1</sup>Virginia Tech, Dept. of Matls. Sci. & Eng., Blacksburg, VA 24060 USA; <sup>2</sup>USP, Escola Politecnica, Sao Paulo Brazil; <sup>3</sup>CNEA, Centro Atomico Bariloche, Bariloche Argentina

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## Charles J. McMahon Interfacial Segregation and Embrittlement Symposium: New Methods for Study of Segregation and Fracture I

*Sponsored by:* ASM International: Materials Science Critical Technology Sector, Structural Materials Division, Materials Processing & Manufacturing Division, Jt. Mechanical Behavior of Materials, Jt. Computational Materials Science & Engineering, Texture & Anisotropy Committee

*Program Organizers:* Vaclav Vitek, University of Pennsylvania, Department of Materials Science and Engineering, Philadelphia, PA 19104 USA; Clyde Briant, Brown University, Division of Engineering, Providence, RI 02912 USA; Harvey D. Solomon, General Electric Company, Research & Development Center, Schenectady, NY 12309 USA

Tuesday PM      Room: 307-308  
February 19, 2002      Location: Washington State Convention & Trade Center

*Session Chairs:* Gregory M. Olson, Northwestern University, Evanston, IL 60208 USA; John L. Bassani, University of Pennsylvania, Dept. of Mechl. Eng., Philadelphia, PA 19104 USA

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### 2:00 PM Invited

**Advanced Analytical Electron Microscopy Studies of Segregation in Metals and Ceramics:** *Manfred R. Hlel*<sup>1</sup>; <sup>1</sup>Max-Planck-Institut f. Metallforschung, Seestr. 92, Stuttgart 70174 Germany

### 2:35 PM Invited

**Nanoscale Studies of Segregation at Heterophase Interfaces:** *David N. Seidman*<sup>1</sup>; Dieter Isheim<sup>1</sup>; Jason T. Sebastian<sup>1</sup>; <sup>1</sup>Northwestern University, Matls. Sci. & Eng., 2225 N. Campus Dr., Matls. & Life Scis. Bldg., Evanston, IL 60208-3108 USA

### 3:10 PM Invited

**A New Method to Predict the Enthalpy and Entropy of Solute Segregation at Individual Grain Boundaries:** *Pavel Lejcek*<sup>1</sup>; Siegfried Hofmann<sup>2</sup>; <sup>1</sup>Institute of Physics, Acad. Sci. Czech Rep., Na Slovance 2, Praha 8 182 21 Czech Republic; <sup>2</sup>Max-Planck-Institut für Metallforschung, Seestr. 92, Stuttgart 70174 Germany

### 3:45 PM

**Segregation of Impurities to the Sigma 5 (310)/[001] STGB and the Influence to the Grain Boundary Structure:** *Juergen M. Plitzko*<sup>1</sup>; Geoffrey H. Campbell<sup>1</sup>; Wayne E. King<sup>1</sup>; Stephen M. Foiles<sup>2</sup>; <sup>1</sup>Lawrence Livermore National Lab, Chem. & Matl. Sci., 7000 E. Ave., MS L-370, Livermore, CA 94550 USA; <sup>2</sup>Sandia National Laboratories, Computl. Matls. Sci. Dept., Albuquerque, NM 87185-1411 USA

### 4:05 PM

**Effects of Segregation on the Interfacial Fracture Energy:** *W. W. Gerberich*<sup>1</sup>; J. M. Jungk<sup>1</sup>; J. W. Hoehn<sup>2</sup>; <sup>1</sup>University of Minnesota, Matls. Sci. & Eng., Minneapolis, MN USA; <sup>2</sup>Seagate Technology, Bloomington, MN USA

### 4:25 PM

**Crystal Orientation Examination of Crack Propagation of the Haz of 1 1/4 Cr-1/2 Mo Steel:** *Shig Saimoto*<sup>1</sup>; Charles H.J. Orchard<sup>1</sup>; Shaotang Cao<sup>1</sup>; <sup>1</sup>Queen's University at Kingston, Matls. & Metall. Eng., Nicol Hall, Union St., Kingston, Ontario K7L 3N6 Canada

### 4:45 PM

**Structural Studies on Segregation of Na in Sigma 3 Boundries of Si Found in Na-Modified Al-Si Eutectic Alloy:** *Mohammad Shamsuzzoha*<sup>1</sup>; <sup>1</sup>University of Alabama, SOMED, Tuscaloosa, AL 35487 USA

### 5:05 PM

**Nonequilibrium Grain Boundary Segregation in Austenitic Stainless Steels Induced by Vacancy Flow and Chemical Binding:** *Edward P. Simonen*<sup>1</sup>; Dan J. Edwards<sup>1</sup>; Stephen M. Bruemmer<sup>2</sup>; <sup>1</sup>PNNL, Matls., PO Box 999, MS P8-15, Richland, WA 99352 USA; <sup>2</sup>PNNL, Matls., PO Box 999, MS P8-16, Richland, WA 99352 USA

### 5:25 PM

**Crack Tip Plasticity in Copper Bicrystals:** *Jin Yu*<sup>1</sup>; J. W. Cho<sup>1</sup>; <sup>1</sup>Korea Advanced Institute of Science and Technology, Ctr. for Elect. Pkgg. Matls. (CEPM) Korea

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## **Charles J. McMahon Interfacial Segregation and Embrittlement Symposium: New Methods for Study of Segregation and Fracture II**

*Sponsored by:* ASM International: Materials Science Critical Technology Sector, Structural Materials Division, Materials Processing & Manufacturing Division, Jt. Mechanical Behavior of Materials, Jt. Computational Materials Science & Engineering, Texture & Anisotropy Committee

*Program Organizers:* Vaclav Vitek, University of Pennsylvania, Department of Materials Science and Engineering, Philadelphia, PA 19104 USA; Clyde Briant, Brown University, Division of Engineering, Providence, RI 02912 USA; Harvey D. Solomon, General Electric Company, Research & Development Center, Schenectady, NY 12309 USA

Wednesday AM Room: 307-308  
February 20, 2002 Location: Washington State Convention & Trade Center

*Session Chairs:* Hiroo Ohtani, Sumitomo Metal Industries, Corporate Rsrch. Labs., Amagasaki Japan 660-0891; Christian Elsässer, Max-Planck-Institut für Metallforschung, Institut für Werkstoffwissenschaft, D-70174 Stuttgart Germany

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### **8:30 AM Invited**

**The Relationship between the Onset of Plastic Flow in Nearly Perfect Silicon Samples and the Brittle to Ductile Transition:**

*David P. Pope*<sup>1</sup>; M. Khantha<sup>1</sup>; Robert H. Folk<sup>1</sup>; Vaclav Vitek<sup>1</sup>; <sup>1</sup>University of Pennsylvania, Matl. Sci. & Eng., Irsrm Bldg., 3231 Walnut St., Philadelphia, PA 19104 USA

### **9:05 AM Invited**

**Effects of Segregation in Cu and Ni<sub>3</sub>Al upon Impact Fracture: An Ultra-High Vacuum Study with Local Probe Scanning Auger/Scanning Electron Microscopy:** *Jeff Th. De Hosson*<sup>1</sup>; D. van Agterveld<sup>1</sup>; G. Palasantzas<sup>1</sup>; <sup>1</sup>University of Groningen,

Dept. of Appl. Phys., Nijenborgh 4, Groningen 9747 AG The Netherlands

### **9:40 AM**

**Segregation in PdO/Pd Alloy Systems:** Matthew Augustine<sup>1</sup>; Heng Zhang<sup>1</sup>; *Harris L. Marcus*<sup>1</sup>; <sup>1</sup>University of Connecticut, Inst. of Matls. Sci., Storrs, CT 06269-3136 USA

### **10:00 AM**

**Effect of Solutes on Grain Boundary Sliding in Aluminum:** *J. S. Vetrano*<sup>1</sup>; C. H. Henager<sup>1</sup>; R. J. Kurtz<sup>1</sup>; R. G. Hoagland<sup>1</sup>; V. Gertsman<sup>1</sup>; <sup>1</sup>Pacific Northwest National Laboratory, Richland, WA 99352 USA

### **10:20 AM**

**Surface Segregation in an Al-4.2At%Ag Alloy:** *Robert W. Hyland*<sup>1</sup>; H. K. Lee<sup>2</sup>; H. I. Aaronson<sup>3</sup>; P. P. Wynblatt<sup>3</sup>; <sup>1</sup>KB Alloys, Inc., R&D/Tech., 220 Old W. Penn Ave., Box 53, Robesonia, PA 19551 USA; <sup>2</sup>International Business Machines Corporation, Gen. Tech. Div., Essex Junction, VT 05452 USA; <sup>3</sup>Carnegie Mellon University, MSE, Pittsburgh, PA 15213 USA

### **10:40 AM**

**The Effect of Impurities on Phase Transformation Kinetics:** *Robert C. Pond*<sup>1</sup>; Steven Celotto<sup>1</sup>; <sup>1</sup>University of Liverpool, Dept. of Eng., Matls. Sci. & Eng., Brownlow Hill, Liverpool L69 3BX UK

### **11:00 AM**

**Segregation, Ordering Effects and Relaxations at Surfaces and Interfaces of the Cu-Au System:** *Hariton Michael Polatoglou*<sup>1</sup>; Anthoula Maidou<sup>1</sup>; <sup>1</sup>Aristotle University of Thessaloniki, Phys. Dept., Gr-54006 Thessaloniki Greece

### **11:20 AM**

**Neutron Irradiation-Induced Non-Equilibrium Intergranular Segregation: Segregation Capability vs. Kinetics:** *Jun Kameda*<sup>1</sup>; Yutaka Nishiyama<sup>2</sup>; Tamara E. Bloomer<sup>3</sup>; <sup>1</sup>Iowa State University, Ames Lab., Ames, IA 50011 USA; <sup>2</sup>Japan Atomic Energy Research Institute, Tokai, Ibaraki 319 Japan; <sup>3</sup>US Nuclear Regulatory Commission, Washington, DC 20555 USA

### **11:40 AM**

**Temperature and Stoichiometry Effects on Grain Boundary Structure and Cohesion in NiAl:** Xuepeng Xie<sup>1</sup>; *Yuri Mishin*<sup>1</sup>; <sup>1</sup>George Mason University, Sch. of Computl. Scis., 4400 University Dr., MSN 5C3, Fairfax, VA 22030 USA

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## **Charles J. McMahon Interfacial Segregation and Embrittlement Symposium: The Effect of Segregation on Environmental Cracking**

*Sponsored by:* ASM International: Materials Science Critical Technology Sector, Structural Materials Division, Materials Processing & Manufacturing Division, Jt. Mechanical Behavior of Materials, Jt. Computational Materials Science & Engineering, Texture & Anisotropy Committee

*Program Organizers:* Vaclav Vitek, University of Pennsylvania, Department of Materials Science and Engineering, Philadelphia, PA 19104 USA; Clyde Briant, Brown University, Division of Engineering, Providence, RI 02912 USA; Harvey D. Solomon, General Electric Company, Research & Development Center, Schenectady, NY 12309 USA

Wednesday PM Room: 307-308  
February 20, 2002 Location: Washington State Convention & Trade Center

*Session Chairs:* Harvey B. Solomon, General Electric, Dept. of Matls. Sci. & Eng., Schenectady, NY USA; David L. Pope, University of Pennsylvania, Dept. of Matls. Sci. & Eng., Philadelphia, PA 19104 USA

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### **2:00 PM Invited**

**Hydrogen Segregation at Interfaces and its Role in Embrittlement:** *Howard K. Birnbaum*<sup>1</sup>; <sup>1</sup>University of Illinois, Matls. Rsrch. Lab., Urbana, IL 61820 USA

### **2:35 PM Invited**

**Effects of Grain Boundary Chemistry and Microstructure on the Intergranular Stress Corrosion Cracking of an Al-Mg Alloy:** *Russell H. Jones*<sup>1</sup>; Donald R. Baer<sup>1</sup>; Michael J. Danielson<sup>1</sup>; Valery Y. Gertsman<sup>1</sup>; John S. Vetrano<sup>1</sup>; Charles F. Windisch<sup>1</sup>; <sup>1</sup>Pacific Northwest National Laboratory, Matls. Scis., PO Box 999, Richland, WA 99352 USA

### **3:10 PM**

**High Temperature Strength of Two Cryomilled Aluminum Alloys:** B. Dehiya<sup>1</sup>; K. Tsuchiya<sup>2</sup>; *J. R. Weertman*<sup>1</sup>; <sup>1</sup>Northwestern University, Matls. Sci. & Eng., Evanston, IL 60208 USA; <sup>2</sup>Toyohashi University of Technology, Production Sys. Eng., Toyohashi, Aichi 441 Japan

### **3:30 PM Invited**

**Grain Boundary Segregation and Precipitation on Intergranular Stress Corrosion Cracking of Austenitic Stainless Alloys in High-Temperature Water Environments:** *Stephen Michael Bruemmer*<sup>1</sup>; <sup>1</sup>Pacific Northwest National Laboratory, Matls. Interfaces & Characterization, PO Box 999, Richland, WA 99352 USA

### **4:05 PM**

**Analysis of Hydrogen-Induced Decohesion at a Particle/Matrix Interface:** *Petros Sofronis*<sup>1</sup>; Yueming Liang<sup>1</sup>; <sup>1</sup>University of Illinois at Urbana-Champaign, Dept. of Theoretl. & Appl. Mech., 216 Talbot Lab., 104 S. Wright St., Urbana, IL 61801 USA

### **4:25 PM**

**On the Correlation between Grain Boundary Segregation, Faceting and Embrittlement in Bi Doped Copper:** *Wilfried Sigle*<sup>1</sup>; Li-Shin Chang<sup>2</sup>; Wolfgang Gust<sup>1</sup>; Manfred Rühle<sup>1</sup>; <sup>1</sup>Max-Planck-Institut fuer Metallforschung, Seestrasse 92, D-70174 Stuttgart Germany; <sup>2</sup>National Chung-Hsing University, 250, Kuo-Kuang Rd., 402 Taichung Taiwan

### **4:45 PM**

**Corrosion and Stress Corrosion Cracking of Al-Mg Alloys:** *Clyde Briant*<sup>1</sup>; Sharvan Kumar<sup>1</sup>; Ping Wang<sup>1</sup>; Zhengfu Wang<sup>1</sup>; <sup>1</sup>Brown University, Div. of Eng., 182 Hope St., Providence, RI 02912 USA

### **5:05 PM**

**On the Stabilization of Grain Boundaries by Solute Segregation:** *Reiner Kirchheim*<sup>1</sup>; <sup>1</sup>Universität Göttingen, Inst. für Materialphysik, Hospitalstr. 3-7, Göttingen D-37073 Germany

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## **Charles J. McMahon Interfacial Segregation and Embrittlement Symposium: Design of New Materials**

*Sponsored by:* ASM International: Materials Science Critical Technology Sector, Structural Materials Division, Materials Processing & Manufacturing Division, Jt. Mechanical Behavior of Materials, Jt. Computational Materials Science & Engineering, Texture & Anisotropy Committee

*Program Organizers:* Vaclav Vitek, University of Pennsylvania, Department of Materials Science and Engineering, Philadelphia, PA 19104 USA; Clyde Briant, Brown University, Division of Engineering, Providence, RI 02912 USA; Harvey D. Solomon, General Electric Company, Research & Development Center, Schenectady, NY 12309 USA

Thursday AM      Room: 307-308  
February 21, 2002      Location: Washington State Convention & Trade Center

*Session Chairs:* John Knott, University of Sheffield England; David Embury, McMaster University, Matls. Sci. & Eng., Hamilton, Ontario L8S 4L7 Canada

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### **8:30 AM Invited**

**The Electrochemical Fatigue Sensor-Development Update:** Y. F. Li<sup>1</sup>; J. Wang<sup>1</sup>; M. Wang<sup>1</sup>; A. Witney<sup>1</sup>; J. DeLuccia<sup>1</sup>; *Campbell Laird*<sup>1</sup>; <sup>1</sup>University of Pennsylvania, Dept. of Matls. Sci. & Eng., 3231 Walnut St., Philadelphia, PA 19104 USA

### **9:05 AM Invited**

**Advanced Metal Science Based on Nano-Metallurgy:** *Kenji Abiko*<sup>1</sup>; <sup>1</sup>Tohoku University, Inst. for Matls. Rsrch., 2-1-1 Katahira, Aoba, Sendai, Miyagi 980-8577 Japan

### **9:40 AM Invited**

**Grain Boundary Engineering for Alleviating Weld Sensitization and Stress Corrosion Cracking in Nickel-Based Alloys:** *Gino Palumbo*<sup>1</sup>; <sup>1</sup>Integran Technologies, Inc., 1 Meridian Rd., Toronto, Ontario M9W 4Z6 Canada

### **10:15 AM Invited**

**Materials by Design: Quantum Steel:** *Gregory B. Olson*<sup>1</sup>; <sup>1</sup>Northwestern University, Dept. of Matls. Sci. & Eng., 2225 N. Campus Dr., Evanston, IL 60208 USA

### **10:50 AM**

**Grain-Boundary Segregation of Trace Elements in Iridium Alloys and Effects on Mechanical Properties:** *E. P. George*<sup>1</sup>; L. Heatherly<sup>1</sup>; C. T. Liu<sup>1</sup>; <sup>1</sup>Oak Ridge National Laboratory, Metals & Cer. Div., 1 Bethel Valley Rd., PO Box 2008, Oak Ridge, TN 37831-6093 USA

### **11:10 AM**

**Failure Mechanisms of Thermal Barrier Coatings-Effect of Alloying Elements and Impurities:** *Jeff Pfaendtner*<sup>1</sup>; Irene Spitsberg<sup>1</sup>; <sup>1</sup>GE Aircraft Engines, Matls. & Proc. Eng. Dept., One Neumann Way, MD M89, Cincinnati, OH 45215 USA

### **11:30 AM**

**Evolution of Grain Boundary Planes in Grain Boundary Engineering:** *Christopher Schuh*<sup>1</sup>; Mukul Kumar<sup>1</sup>; Wayne E. King<sup>1</sup>; Lan Nguyen<sup>1</sup>; <sup>1</sup>Lawrence Livermore National Laboratory, Matls. Sci. & Tech., 7000 East Ave., L-350, Livermore, CA 94550 USA