Symposium 12: Materials for Extreme Environments: Ultrahigh Temperature Ceramics (UHTCs) and Nano-Laminated Ternary Carbides and Nitrides (MAX Phases)

Tuesday, January 29, 2013

Materials Design: MAX Phases and UHTCs

1:30 PM-3:20 PM
Room: Coquina Salon F
Session Chair(s): Sylvain Dubois

1:30 PM
(ICACC-S12-001-2013) The application of Axial Next-Nearest-Neighbor Ising model to the description of the MAX phases (Invited Speaker)
Thierry Ouisse*, Didier Chaussende, Grenoble INP, France

2:00 PM
(ICACC-S12-002-2013) Discovery of the new MAX phase Nb2GeC by a systematic theoretical-experimental approach
Per Eklund*, Martin Dahlqvist, Olof Tengstrand, Lars Hultman, Jun Lu, Linköping University, Sweden; Nils Nedfors, Ulf Jansson, Uppsala University, Sweden; Johanna Rosén, Linköping University, Sweden

2:20 PM
(ICACC-S12-003-2013) Thin films of Ga-based MAX phases: Cr2GaC and (Cr,Mn)2GaC
Andrejs Petruhins*, Arni Sigurdur Ingason, Aurelija Mockute, Per Persson, Johanna Rosen, Linköping University, Sweden

2:40 PM
(ICACC-S12-004-2013) Synthesis of epitaxial (Cr,Mn)2AlC - a potential magnetic MAX phase
Aurelija Mockute*, Martin Dahlqvist, Linköping University, Sweden; Jens Emmerlich, RWTH-Aachen University, Germany; Lars Hultman, Linköping University, Sweden; Jochen M Schneider, RWTH-Aachen University, Germany; Per Persson, Johanna Rosen, Linköping University, Sweden

3:00 PM
Break

Materials Design II

3:20 PM-4:40 PM
Room: Coquina Salon F
Session Chair(s): Per Eklund

3:20 PM
(ICACC-S12-005-2013) Design of High Emissivity Coatings for Hypersonic Applications using Plasma Spray
Winnie Tan*, Alejandro H Strachan, Rodney W Trice, Purdue University, USA

3:40 PM
(ICACC-S12-006-2013) Synthesis of Novel Hafnium-Containing Ultrahigh-Temperature Ceramic Nanocomposites
Emanuel Ionescu*, Jia Yuan, Bernd Mainzer, Hans-Joachim Kleebe, Ralf Riedel, Technische Universitaet Darmstadt, Germany

4:00 PM
(ICACC-S12-007-2013) Graphene NanoPlatelets Reinforced Tantalum Carbide Consolidated by Spark Plasma Sintering
Andy Nieto*, Debrupa Lahiri, Arvind Agarwal, Florida International University, USA

4:20 PM
(ICACC-S12-008-2013) First Steps into Near-Net-Shape Manufacture of UHTC components: Colloidal Processing Revolution
Structure-Property Relationships I

4:40 PM-5:40 PM
Room: Coquina Salon F
Session Chair(s): Thierry Ouisse

4:40 PM
(ICACC-S12-009-2013) Plasmon excitations in MAX phases: evidence of atomic scale superlattice-like behavior
Vincent Mauchamp*, Institut Pprime, France; Matthieu Bugnet, Mc Master University, Canada; Patrick Chartier, Thierry Cabioc'h, Michel Jaouen, Institut Pprime, France

5:00 PM
(ICACC-S12-010-2013) Evidence for anisotropic transport properties of Ti2AlC
Wenbo Yu, Vincent Mauchamp, Véronique Gauthier-Brunet, Thierry Cabioc'h, Institut PPRIME, France; Loïk Gence, Luc Piraux, Université catholique de Louvain, Belgium; Per Eklund, Linköping University, Sweden; Sylvain Dubois*, Institut PPRIME, France

5:20 PM
(ICACC-S12-011-2013) The electronic-structure origin of the anisotropic thermopower of nanolaminated Ti3SiC2 determined by polarized x-ray spectroscopy and Seebeck measurements
Martin Magnuson*, Department of Physics, Chemistry and Biology (IFM), Sweden; Maurizio Mattesini, Astronomia y Astrofísica I, Universidad Complutense de Madrid, Spain; Ngo Van Nong, Technical University of Denmark, Denmark; Per Eklund, Lars Hultman, Department of Physics, Chemistry and Biology (IFM), Sweden

Structure-Property Relationships II

8:00 AM-9:50 AM
Room: Coquina Salon F
Session Chair(s): Ji Zou

8:00 AM
(ICACC-S12-012-2013) Computational modeling of grain boundaries in ZrB2: implications for lattice thermal conductivity
John W Lawson*, NASA Ames Research Center, USA; Murray S Daw, Clemson University, USA; Thomas H Squire, Charles W Bauschlicher, NASA Ames Research Center, USA

8:20 AM
Jason Michael Lonergan*, William Fahrenholtz, Gregory Hilmas, Missouri University of Science & Technology, USA

8:40 AM
(ICACC-S12-014-2013) Correlation between magnetic state and bulk modulus of Cr2AlC
Martin Dahlqvist*, Björn Alling, Johanna Rosén, Linköping University, Sweden

9:00 AM
(ICACC-S12-015-2013) Study of deformation mechanisms of the Ti2AlN MAX phase at room temperature
Antoine Guittion*, Anne Joulain, Ludovic Thilly, Christophe Tromas, Pprime Institute, France; Steven Van Petegem, Helena Van Swygenhoven, Paul Scherrer Institute, Switzerland

9:20 AM
(ICACC-S12-016-2013) Influence of Precursors
Stoichiometry on SHS Synthesis of Ti2AlC Powders
Leszek Chlubny*, Jerzy Lis, AGH-University of Science and Technology, Poland

9:40 AM
Break

Structure-Property Relationships III

9:50 AM-12:00 PM
Room: Coquina Salon F
Session Chair(s): John Lawson

9:50 AM
(ICACC-S12-017-2013) Influence of compositions and processing on the elastic modulus and internal friction of ZrB2 based Ultra-high Temperature Ceramics (Invited Speaker)
Ji Zou*, Akhilesh Kumar Swarnakar, Jef Vleugels, Omer Van der Biest, Katholieke Universiteit Leuven, Belgium; Guo-Jun Zhang, Shanghai Institute of Ceramics, China

10:20 AM
David Pham*, Luke S Walker, Erica L Corral, University of Arizona, USA

10:40 AM
Gregory John Kenneth Harrington*, Greg E Hilmas, William G Fahrenholtz, Missouri University of Science and Technology, USA

11:00 AM
(ICACC-S12-020-2013) The effect of chemical composition on the densification, thermal and oxidation behaviour of different stoichiometries of zirconium and hafnium oxycarbides
Doni D Jayaseelan*, Song Wang, Xin Yanda, Imperial College, United Kingdom; Peter Brown, DSTL Porton Down, United Kingdom; William (Bill) Lee, Imperial College, United Kingdom

11:20 AM
(ICACC-S12-021-2013) Fabrication on thermal stability of HfB2 matrix composite at severe oxidation condition
Ali Goodarzi*, Hailey Taylor, Harvard University, USA

Structural Stability under Extreme Environments I

1:30 PM-3:20 PM
Room: Coquina Salon F
Session Chair(s): Matthieu Bugnet

1:30 PM
(ICACC-S12-022-2013) Arc-jet testing of LaB6-containing ZrB2-SiC materials under high enthalpy supersonic air flows (Invited Speaker)
Frederic Monteverde*, National Research Council of Italy, Italy

2:00 PM
(ICACC-S12-023-2013) Testing and Predictive Modelling of Ultra High Temperature Structural Ceramics
Michele Pettina*, Doni D Jayaseelan, Imperial College London, United Kingdom; Andrew Heaton, Peter M Brown, DSTL Porton Down, United Kingdom; Kamran Nikbin, Imperial College London, United Kingdom

2:20 PM
Andy Nieto*, Debrupa Lahiri, Cheng Zhang, Arvind Agarwal, Florida International University, USA

2:40 PM
(ICACC-S12-025-2013) Modelling of oxidation
effects in the Ultra High Temperature Ceramic structures
Michele Pettina*, Imperial College London, United Kingdom; Frank Abdi, Alpha STAR Corporation, USA; Kamran Nikbin, Imperial College London, United Kingdom

3:00 PM
Break

Structural Stability under Extreme Environments II

3:20 PM
Room: Coquina Salon F
Session Chair: Shaoming Dong

3:20 PM
(ICACC-S12-026-2013) Behavior of MAX phase thin films under ion irradiation (Invited Speaker)
Matthieu Bugnet*, Vincent Mauchamp, Thierry Cabioc'h, CNRS-Université de Poitiers-ENSMA, France; Erwan Olivier, CNRS-IN2P3-Université Paris-Sud, France; Florian Mortreuil, CNRS-Université de Poitiers-ENSMA, France; Per Eklund, Linköping University, IFM, Sweden; Michel Jaouen, CNRS-Université de Poitiers-ENSMA, France

3:50 PM
(ICACC-S12-027-2013) Ultra High Temperature Mechanical Testing of ZrB2 Based Ceramics
Eric W Neuman*, Gregory E Hilmas, William G Fahrenholtz, Missouri University of Science and Technology, USA

4:10 PM
(ICACC-S12-028-2013) Hafnia polycrystals with a polymer-derived amorphous HfSiCNO interfacial phase for Ultrahigh Temperature Structural Applications
Ilya Lisenker*, Rishi Raj, University of Colorado, USA

4:30 PM
(ICACC-S12-029-2013) Thermal Stability of Cr2AIC and Ta4AlC3 in Argon Atmosphere at Elevated Temperature
Jim Low*, Curtin University, Australia

Thursday, January 31, 2013
Novel Characterization Methods and Lifetime Assessment I

8:00 AM
Room: Coquina Salon F
Session Chair: Guo-Jun Zhang

8:00 AM
(ICACC-S12-030-2013) High Temperature Oxidation Induced Crack Healing of MAX phases (Invited Speaker)
Wim G. Slooof*, Lu Shen, Delft University of Technology, Netherlands; Shibo Li, Beijing Jiaotong University, China; Gui-Ming Song, Cees Kwakernaak, Sybrand van der Zwaag, Delft University of Technology, Netherlands

8:30 AM
(ICACC-S12-031-2013) Synthesis and characterization of Ti2Al(C(1-x)N)\_y \text{ MAX phase solid solutions}
Wenbo Yu, Véronique Gauthier-Brunet, Christophe Tromas, Thierry Cabioc'h, Sylvain Dubois*, Institut PPRIME, France

8:50 AM
(ICACC-S12-032-2013) Critical analysis of effects from geometry and size on oxidation behavior of ultra-high temperature ceramics in tube and thermogravimetric furnace
Melia Miller-Oana*, Luke Walker, Erica Corral, University of Arizona, USA

9:10 AM
(ICACC-S12-033-2013) Effects of hyperthermal and thermal oxygen beam exposures on oxidation behavior of ultra-high temperature ceramics
Melia Miller-Oana*, Luke Walker, University of Arizona, USA; Vanessa Murray, Timothy Minton, Montana State University, USA; Erica Corral,
University of Arizona, USA

9:30 AM
(ICACC-S12-034-2013) XRD and TG-DSC Analysis of the Silicon Carbide-Palladium Reaction
Marialuisa Gentile*, Ping Xiao, The University of Manchester, United Kingdom

9:50 AM
Break

Novel Characterization Methods and Lifetime Assessment II
10:00 AM-11:50 AM
Room: Coquina Salon F
Session Chair(s): Wim G. Sloof

10:00 AM
(ICACC-S12-035-2013) High-Temperature Strength Measurements and Arc-Jet Testing of Cf-HfB2 UHTC Composites
Anish Paul*, Jon Binner, Bala Vaidhyanathan, Loughborough University, United Kingdom; Andrew Heaton, Peter Brown, Dstl, United Kingdom

10:30 AM
(ICACC-S12-036-2013) Effect of air exposure temperature and time on room temperature strength of ZrB2 and ZrB2-SiC composite
Manish Patel*, J. J Reddy, V. V Bhanu Prasad, Defence Metallurgical Research Laboratory, India; Vikram Jayaram, Indian Institute of Science, India; A. A Ghokhale, Defence Metallurgical Research Laboratory, India

10:50 AM
(ICACC-S12-037-2013) Repeatability of Measurements and Initial Stage Oxidation in ZrB2-30vol%SiC
Kathleen N. Shugart*, Elizabeth J Opila, University of Virginia, USA

11:10 AM
(ICACC-S12-038-2013) Studies on Oxidation of C-ZrB2-SiC at 1800°C Using a Novel Ultra-high Temperature Oxidation Testing Apparatus
Zenghua Gao*, Jingjun Xu, Meishuan Li, Institute of Metal Research, Chinese Academy of Sciences, China

11:30 AM
(ICACC-S12-039-2013) In-situ observation of the growth kinetics of SiO2 during passive oxidation of SiC under various Ar/O2, Ar/CO2, Ar/CO2/O2 gas mixtures at very high temperatures
Francis Teyssandier*, Mathieu Brisebourgh, Francis Rebillat, CNRS-LCTS, France

Novel Methods for Joining and Machining of Components
1:30 PM-3:20 PM
Room: Coquina Salon F
Session Chair(s): Zenghua Gao

1:30 PM
William Pinc, Luke S Walker, Erica L Corral*, University of Arizona, USA

2:00 PM
(ICACC-S12-041-2013) Welding of Ultra High Temperature ZrB2 Ceramics
Derek King*, Greg Hilmas, William Fahrenholtz, Missouri University of Science and Technology, USA

2:20 PM
(ICACC-S12-042-2013) High Temperature Joining Solution For Thermal Protection Systems Based On Intermetallic Alloys
Jorge Barcena*, Cristina Jimenez, Miguel Lagos, Tecnalia Research & Innovation, Spain; Konstantina Mergia, N.C.S.R. "Demokritos, Greece; Inigo Agote,
Novel Processing Methods

3:20 PM
(ICACC-S12-044-2013) Zirconium carbide ceramics for potential applications in extreme environments of ultra high temperature or strong radiation
Guo-Jun Zhang*, Shanghai Institute of Ceramics, China

3:40 PM
(ICACC-S12-045-2013) Si-SiC-ZrB2 ceramics produced by reactive silicon infiltration
Alberto Ortona*, SUPSI, Switzerland; Sara Biamino, Politecnico di Torino, Italy; Claudio D'Angelo, SUPSI, Switzerland; Giuseppe D'Amico, Paolo Fino, Politecnico di Torino, Italy

4:00 PM
(ICACC-S12-046-2013) Ultra-Low Temperature Sintering of Ultra-High Temperature Ceramics
Hiroshi Kimura*, Natl Defense Academy, Japan

4:20 PM
(ICACC-S12-047-2013) Synthesis and Sintering of TaC-HfC ceramics by SHS and RSPS techniques
Omar Cedillos*, Doni D Jayaseelan, William E Lee, Imperial College London, United Kingdom

5:00 PM
(ICACC-S12-049-2013) Synthesis and Sintering of Ta2AlC and Ti2AlC coatings
Arman Sedghi*, Rezvan Vahed, Ahmad Razaghian Arani, Imam Khomeini International University, Islamic Republic of Iran

4:40 PM
(ICACC-S12-048-2013) Synthesis of HfB2 Powders for Aerospace Applications
Pengxiang Zheng*, Saranya Venugopal, Anish Paul, Bala Vaidhyanathan, Jon Binner, Loughborough University, United Kingdom

5:20 PM
(ICACC-S12-050-2013) Study the parameters of Ti2AlC and Ti3AlC2 MAX phases fabrication by Mechanically Activated Self-propagating High temperature Synthesis
Arman Sedghi*, Rezvan Vahed, Ahmad Razaghian Arani, Imam Khomeini International University, Islamic Republic of Iran

Friday, February 1, 2013
Methods for Improving Damage Tolerance, Oxidation and Thermal Shock Resistance I

8:00 AM-9:50 AM
Room: Coquina Salon F
Session Chair(s): Luke Walker
8:00 AM
(ICACC-S12-052-2013) Behaviors of Ceramic Matrix Composites (CMCs) and ultrahigh temperature ceramic (UHTC) Coatings at High Temperature Environments (Invited Speaker)
Shaoming Dong*, Xiangyu Zhang, Yusheng Ding, Le Gao, Haijun Zhou, Zhen Wang, Ping He, Yanmei Kan, Shanghai Institute of Ceramics, CAS, China

8:30 AM
Benjamin J Lai*, Jeremy L Watts, Gregory E Hilmas, William G Fahrenholtz, Missouri University of Science and Technology, USA

8:50 AM
(ICACC-S12-054-2013) Fabrication and Characterization of Continuous SiC Fiber Reinforced HfB2-SiC Composites
Clifford James Leslie*, Emmanuel Boakye, Kristin Keller, Michael Cinibulk, AFRL, USA

9:10 AM
Jeremy Watts*, Gregory Hilmas, William Fahrenholtz, Missouri S & T, USA

9:30 AM
Break

Methods for Improving Damage Tolerance, Oxidation and Thermal Shock Resistance II

9:50 AM
(ICACC-S12-056-2013) Study of SiC fiber-matrix interaction in ultra-high temperature ceramics by transmission electron microscopy
Laura Silvestroni*, Sciti Dileitta, CNR, Italy

10:10 AM
(ICACC-S12-057-2013) High temperature oxidation resistant ceramic matrix composites by reverse infiltrated ultra high temperature ceramic-coated carbon-carbon composites.
Luke Sky Walker*, Erica L Corral, The University of Arizona, USA

10:30 AM
(ICACC-S12-058-2013) Sub-micron HfB2 Powder Protected Cf - Preform
Saranya Venugopal*, Anish Paul, Loughborough university, United Kingdom; Pengxiang Zheng, Bala Vaidhyanathan, Jon Binner, Loughborough University, United Kingdom; Andrew Heaton, Peter Brown, DSTL, United Kingdom

10:50 AM
(ICACC-S12-059-2013) The Effect of WO3 on Sinterability and Properties of ZrO2 Ceramics
Maryam Kazemzadeh Dehdashti*, William G Fahrenholtz, Gregory E Hilmas, Missouri University of Sience and Technology, USA

11:10 AM
(ICACC-S12-060-2013) Influence of precursor ZrC powders on the properties of the spark plasma sintered ceramic composite materials
Nikolai Voltsihihin*, Irina Hussainova, Der-Liang Yung, Tallinn University of Technology, Estonia; Erkin Cura, Simo-Pekka Hannula, Aalto University, Finland

Wednesday, January 30, 2013
S12 Poster Session
5:00 PM-7:30 PM
Room: Ocean Center

(ICACC-S12-P149-2013) Improved processing of
carbon nanotube/magnesium alloy composites
Ali Goodarzi*, Hailey Taylor, Harvard University, USA

(ICACC-S12-P150-2013) ZrC-based composites for high temperature applications
Irina Hussainova*, Der-Liang Yung, Lauri Kollo, Nikolai Voltsihhin, Rainer Traksmaa, Tallinn University of Technology, Estonia

(ICACC-S12-P151-2013) Chromium-alloyed MoSi2-composite
Erik O Strom*, Qin Lu, Anders Magnusson, Sandvik Heating Technology, Sweden

(ICACC-S12-P152-2013) Processing and Characterization of Porous Ti2AlC with Controlled Porosity and Pore Size
Liangfa Hu*, Rogelio Benitez, Sandip Basu, Ibrahim Karaman, Miladin Radovic, Texas A&M University, USA

(ICACC-S12-P153-2013) High temperature oxyacetylene torch testing and oxidation behavior of graphite, ZrB2, and ZrB2-SiC at temperatures greater than 1500°C
Paul Neff*, University of Arizona, USA; Amber Powell, Missouri University of Science & Technology, USA; Luke S Walker, Erica L Corral, University of Arizona, USA

(ICACC-S12-P154-2013) A Testing Facility for Root Cause Analysis of Failure Under Extreme Temperatures
Julius Chatterjee, Hsin-Lun Chen, Michael Mooty, John Reali, James R Brenner*, Florida Tech, USA

(ICACC-S12-P155-2013) Spark Plasma Sintered ZrB2-SiC Composites
Richard Stadelmann*, University of Central Florida, USA; Vincenzo M Sglavo, University of Trento, Italy; Nina Orlovskaya, University of Central Florida, USA