

Program

Ultra-High Temperature Ceramics: *Materials for Extreme Environment Applications II*

May 13 - 18, 2012

Schloss Hernstein
Hernstein, Austria

Conference Chairs:

Bill Fahrenholtz

Missouri University of Science & Technology

Bill Lee

Imperial College, London

Eric Wuchina

Naval Surface Warfare Center

Yanchun Zhou

Aerospace Research Institute of Materials and Processing Technology



Engineering Conferences International

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Sunday, May 13, 2012

17:00 – 18:00	Conference Check-in (Schloss Hernstein Lobby)
18:00 – 19:00	Opening Reception (Historic area)
19:00 – 20:30	Dinner (Schloss Restaurant)
20:30 – 21:30	Reception (Hotel Bar)

NOTES

- *Technical sessions will be held in Hofsuite 1-2*
- *Coffee breaks will be in the cafeteria (in front of the conference room)*
- *Audiotaping, videotaping and photography of presentations are prohibited.*
- *Speakers – Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before).*
- *Speakers – Please leave at least 5 minutes for questions and discussion.*
- *Please do not smoke at any conference functions.*
- *Turn your mobile phones to vibrate or off during technical sessions.*

Monday, May 14, 2012

07:30 – 09:00 Breakfast
09:00 – 09:15 Opening Remarks
Conference Chairs
ECI Technical Liaison

SESSION I: CHALLENGES AND OPPORTUNITIES

09:15 – 9:45 **Ultra-High Temperature Ceramics: Historic Perspectives and Recent Progress**
Bill Fahrenholtz, Missouri University of Science and Technology, USA

9:45 – 10:15 **The Next Steps for Ultra-High Temperature Ceramics**
Eric Wuchina, Naval Surface Warfare Center, USA

10:15 – 10:45 Coffee Break

10:45 – 11:15 **Invited
Nuclear applications for UHTCs**
Dan Riley, Australian Nuclear Science and Technology Organization, Australia

11:15 – 11:45 **Processing and behavior of UHTCs for aerospace applications**
Michael Cinibulk, Air Force Research Laboratory, USA

11:45 – 12:30 **Poster Preview Presentations, Part 1 (Posters 1-8)**
Three slides and three minutes for each poster presenter to introduce their poster

12:30 – 13:30 Lunch

13:30 – 15:30 Free time for recreation, *ad hoc* discussions

15:30 – 16:00 Afternoon Coffee

SESSION II: COMPOSITES AND CARBIDES

16:30 – 17:00 **Invited
Microstructure formation pathways and deformation mechanisms in tantalum carbides**
Gregory Thompson, University of Alabama, USA

17:00 – 17:20 **High temperature creep behavior of B₄C polycrystals prepared by spark plasma sintering**
Bibi Malmal Moshtaghion, University of Seville, Spain and Isfahan Institute of Technology, Iran

17:20 – 17:40 **Carbon fiber reinforced UHTC matrix composites**
Shaoming Dong, Shanghai Institute of Ceramics, CAS, China

17:40 – 18:00 **Fabrication, properties, and arc-jet testing of ZrB₂-based composites
Containing short SiC fibers**
Frederic Monteverde, ISTEC-CNR, Italy

Monday, May 14, 2012 (continued)

- | | |
|---------------|---|
| 18:00 – 18:20 | SiC/SiC ceramic matrix composites: A turbine engine perspective
Adam Chamberlain, Rolls-Royce Corporation, USA |
| 18:20 – 18:40 | In-situ imaging and strain determination during fracture in a SiC/SiC ceramic matrix composite
Joaquin Ramirez Rico, Universidad de Sevilla - CSIC, Spain |
| 19:00 – 20:30 | Dinner |
| 20:30 – 22:00 | Wine Tasting |

Tuesday, May 15, 2012

07:30 – 09:00 Breakfast

SESSION III: SYNTHESIS AND PROCESSING

09:00 – 09:30

Invited
Sintering and densification of UHTCs
Diletta Sciti, ISTEC-CNR, Italy

09:30 – 09:50

Towards complex shape manufacture of UHTCs by colloidal processing
Carolina Tallon, The University of Melbourne, Australia

09:50 – 10:10

Advanced fabrication of UHTC composites with polymer precursors
JunPing Li, Aerospace Research Institute, China

10:10 – 10:40

Coffee Break

10:40 – 11:10

Low temperature synthesis and sintering of mechanically activated ZrB₂ powders
Mustafa Tuncer, Dumlupinar University, Turkey

11:10 – 11:30

ZrB₂-ZrC-SiC foam from zirconoborosiloxane oligomer
B. Swaminathan, Vikram Sarabhai Space Center, India

11:30 – 12:40

Poster Preview Presentations, Part 2 (Posters 9-18)
Three slides and three minutes for each poster presenter to introduce their poster

12:45 – 13:45

Lunch

13:45 – 16:00

Free Time for recreation, *ad hoc* discussions

16:00 – 16:30

Afternoon Coffee

SESSION IV: PROCESSING AND JOINING

16:30 – 17:00

Invited
Ultra-high temperature ceramics: Advanced processing methods and properties
Erica Corral, The University of Arizona, USA

17:00 – 17:30

Invited
UHTC composites for ultra-high temperature applications
Jon Binner, Loughborough University, United Kingdom

17:30 – 17:50

Joining of ultra-high temperature ceramics
Laura Silvestroni, CNR-ISTEC, Italy

17:50 – 18:10

Solid state diffusion bonding of ZrC to Zr-based alloys
Andrew Gillen, Institute of Materials Engineering, ANSTO, Australia

18:10 – 18:30

Fusion Welding of ZrB₂-based Ceramics
William Fahrenholtz, Missouri University of Science and Technology, USA

Tuesday, May 15, 2012 (continued)

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|---------------|---|
| 18:30 – 18:50 | Combination of RMI and SPS routes for fabrication of fully dense ZrB₂-ZRC composites
Song Wang, National University of Defense Technology, China |
| 19:00 – 20:30 | Dinner |
| 20:30 – 22:00 | Poster Session with social hour |

Wednesday, May 16, 2012

07:30 – 09:00 Breakfast

SESSION V: TESTING AND OXIDATION

09:00 – 09:45 **Keynote**
UHTC-based hot structures for space re-entry: lesson learned and future perspectives
Luigi Scatteia, CIRA - Italian Aerospace Research Centre, Italy

09:45 – 10:15 **Invited**
Modeling extreme environment response of UHTCs
T.A. Parthasarathy, Air Force Research Laboratory/UES Inc., USA

10:15 – 10:35 **Structural evolution during oxidation and its effect on strength of UHTCs**
Doni Daniel Jayaseelan, Imperial College London, UK

10:35 – 11:05 Coffee break

11:05 – 11:35 **A cost effective screening technique of UHTC materials using an Oxy-acetylene torch flame**
Anish Paul, Loughborough University, United Kingdom

11:35 – 11:55 **Oxidation behavior of ZrB₂-SiC-TaC ceramics**
Yiguang Wang, Northwestern Polytechnical University, China

12:15 Boxed lunches

12:30 – 18:30 Depart for afternoon excursion to Vienna. Time to spend the afternoon discovering this beautiful city on your own with a provided map or to see the city on a Hop-On, Hop-Off bus tour. (Bus tour paid directly to company.)

19:00 Dinner

20:30 – 22:00 Poster Session with social hour

Thursday, May 17, 2012

07:30 – 09:00 Breakfast

SESSION VI: PROPERTIES AND CHARACTERIZATION

- 09:00 – 09:30 **Invited**
Ultra-high temperature thermal and mechanical properties of ZrB₂-based ceramics
Greg Hilmas, Missouri University of Science and Technology, USA
- 09:30 – 09:50 **High temperature mechanical properties of zirconium diboride**
Luc Vandeperre, Imperial College London, United Kingdom
- 09:50 – 10:10 **High temperature physical and mechanical properties improvement in ZrB₂-SiC ceramics: Benefits from high purity ZrB₂ powders and transition metal carbide additions**
Ji Zou, Katholieke Universiteit Leuven, Belgium
- 10:10 – 10:40 **Invited**
High temperature mechanical, oxidation and shock resistance properties of hot pressed and spark plasma sintered TiB₂-based ceramics
Bikramjit Basu, Indian Institute of Science, India
- 10:40 – 11:10 Coffee break
- 11:10 – 11:40 **Invited**
Textured diboride based UHTCs with anisotropic properties
Guo-Jun Zhang, Shanghai Institute of Ceramics, China
- 11:40 – 12:00 **Powder synthesis, consolidation and mechanical characteristics of amorphous ultra-high temperature ceramics**
Hiroshi Kimura, National Defense Academy, Japan
- 12:00 – 12:20 **Microstructures and thermal conductivities of hot-pressed ZrB₂-SiC ceramics with a variety of SiC sources**
Seongwon Kim, Korea Institute of Ceramic Engineering and Technology, Korea
- 12:20 – 13:20 Lunch
- 13:20 – 16:00 Free time for recreation, *ad hoc* discussions
- 16:00 – 16:30 Afternoon Coffee
- SESSION VII: CHARACTERIZATION**
- 16:30 – 17:00 **Invited**
Advanced characterization of composite ultra high temperature ceramic systems
W.E. Lee, Imperial College London, United Kingdom
- 17:00 – 17:20 **Where we are with the understanding of metal/ceramic interactions: The case of transition metal borides**
Alberto Passerone, IENI-CNR, Italy

Thursday, May 17, 2012 (continued)

- 17:20 – 17:50 **Microstructure characterization of UHTCs using high resolution TEM**
Yanchun Zhou, Aerospace Research Institute of Materials and Processing
Technology, China
- 17:50 – 18:20 **Invited**
Advanced high-temperature material testing in an ICP torch facility
Doug Fletcher, University of Vermont, USA
- 18:20 – 18:40 **Using the consolidated nanomaterials-based high-melting compounds for
extreme environmental applications**
Rostislav Andrievski, Institute of Problems of Chemical Physics, RAS, Russia
- 19:00 Conference Dinner followed by social hour

Friday, May 18, 2012

07:30 – 08:80 Breakfast

Wrap-Up Session:

08:30 – Noon **Informal discussions for post-conference publications and planning for next meeting**

12:30 Lunch (or boxed lunch) and return to Vienna Airport

Poster Presentations

- 1. Materials design of FG-UHTC based on “Ridge-Effect” phenomenon**
Igor L. Shabalin, The University of Salford, United Kingdom
- 2. Thermal shock properties of 2D C/SiC prepared by chemical vapor infiltration**
Chengyu Zhang, Science and Technology on Thermostructural Composite Materials Laboratory, China
- 3. Processing of ZrB₂ and HfB₂ based ultra high temperature ceramics**
J. Sonber, Materials Group, India
- 4. Microstructure and mechanical properties of ZrB₂-Nb composites**
Sun Xin, Aerospace Research Institute of Materials and Processing Technology, China
- 5. First principles investigation of chemical bonding and elastic modulus of UHTCs**
Junshan Wang, Aerospace Research Institute of Materials and Processing Technology, China
- 6. Interfacial coatings on carbon fibers**
Natalia Baklanova, Institute of Solid State Chemistry and Mechanochemistry, RAS, Russia
- 7. Solid solution behavior in transition metal carbides**
Maryam Nojabae, Iran University of Science and Technology, Iran
- 8. Fabrication of TaC-HfC ceramics for ultra-high temperature applications**
Omar Cedillos-Barraza, Imperial College London, United Kingdom
- 9. Densification and high temperature mechanical properties of TiB₂ and ZrB₂-based composites**
Neha Gupta, Indian Institute of technology Kanpur (IITK), India
- 10. Effects of carbon on the processing and thermal properties of hot pressed ZrB₂**
Greg Harrington, Missouri University of Science and Technology, USA
- 11. HfB₂ powders via sol-gel processing**
Saranya Venugopal, Loughborough University, United Kingdom
- 12. Ultra high temperature ceramics (UHTCs) for aerospace applications**
Pengxiang Zheng, Loughborough University, United Kingdom
- 13. Elevated temperature deformation mechanisms in Ta₂C**
Nicholas De Leon, The University of Alabama, USA
- 14. Microstructure, tribological response, and mechanical properties of fiber bonded silicon carbide ceramics**
M. C. Vera, Universidad de Sevilla-CSIC, Spain
- 15. Ultra high temperature mechanical testing methodology of ZrB₂ based ceramics**
Eric W. Neuman, Missouri University of Science and Technology, USA
- 16. Low-temperature MOCVD process for deposition of IR- and HF-containing refractory films**
Natalia B. Morozova, Nikolaev Institute of Inorganic Chemistry SB RAS, Russia
- 17. Characterization of mechanically activated zirconium diboride (ZrB₂) powders**
Mustafa Tuncer, Dumlupinar University, Turkey