

Program

Ultra-high Temperature Ceramics:

Materials for Extreme Environment Applications III

An ECI Conference Series

April 12-16, 2015
Gold Coast, Australia

Co-Chairs

Dr. Carolina Tallon, The University of Melbourne

Prof. George Franks, The University of Melbourne



Engineering Conferences International
32 Broadway, Suite 314 - New York, NY 10004, USA
Phone: 1 - 212 - 514 - 6760
www.engconfintl.org – info@engconfintl.org

**Outrigger Surfers Paradise
22 View Avenue
Surfers Paradise, QLD 4217
Tel: +61-7-5579-1000**

Engineering Conferences International (ECI) is a not-for-profit global engineering conferences program, originally established in 1962, that provides opportunities for the exploration of problems and issues of concern to engineers and scientists from many disciplines.

ECI BOARD MEMBERS

Barry C. Buckland, President
Mike Betenbaugh
Peter Gray
Michael King
Raymond McCabe
David Robinson
William Sachs
Eugene Schaefer
P. Somasundaran

Chair of ECI Conferences Committee: William Sachs

ECI Technical Liaison for this conference: Ram Darolia

ECI Executive Director: Barbara K. Hickernell

ECI Associate Director: Kevin M. Korpics

Scientific Committee

Prof. Bill Fahrenholtz, Missouri University of Science & Technology, Rolla, US

Dr. Eric Wuchina, Naval Surface Warfare Center, W. Bethesda, MD, US

Prof. Jon Binner, University of Birmingham, UK

Dr. Laura Silvestroni, Institute of Science and Technology for Ceramics ISTECC, Italy

Prof. Yanchun Zhou, Aerospace Research Institute of Materials and Processing Technology,
China

Dr. Sylvia Johnson, NASA-Ames Research Center

Previous conferences in this series

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

Aug. 3-8, 2008

Lake Tahoe, California

Conference Chairs:

Eric Wuchina, Naval Surface Warfare Center, USA

Alida Bellosi, Institute of Science & Technology for Ceramics, Italy

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

May 13-18, 2012

Hernstein, Austria

Conference Chairs:

Bill Fahrenholtz, Missouri University of Science & Technology, USA

Bill Lee, Imperial College, London, UK

Eric Wuchina, Naval Surface Warfare Center, USA

Yanchun Zhou, Aerospace Research Inst. Of Materials & Processing Technology, China

With the support of Defence Materials Technology Centre (DMTC)



Conference endorsed by the American Ceramic Society



Sunday, April 12, 2015

17:00 - 19:00	Registration (Boulevard Pre Function/Foyer)
18:00 - 19:00	Welcome Reception
19:00 - 21:00	Dinner

Notes

- *All technical sessions will be in Boulevard Ballroom 2. Poster session will be in Boulevard Pre Function/Foyer.*
- *Lunches and dinners will be in . Boulevard Ballroom 1. Breakfasts will be in the Deja View Restaurant.*
- *No recording, please! The use of any devices to capture images (e.g., camera or camera phones) or sound (e.g., tape and digital recorders) is strictly prohibited at all technical and poster sessions without the express written consent, obtained in advance, from ECI.*
- *Speakers – Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before).*
- *Speakers – Please leave at least 3-5 minutes for questions and discussion.*
- *Please do not smoke at any conference functions.*
- *Turn your mobile telephones to vibrate or off during technical sessions.*
- *Please write your name on your program so that it can be returned to you if lost or misplaced.*
- *After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.*

Monday, April 13, 2015

Breakfast (Deja View Restaurant): Opens 06:30

09:00 - 09:20 Opening Remarks (Carolina Tallon, Chair; Ram Darolia, ECI Liaison)

Session Chair: Carolina Tallon, The University of Melbourne, Australia

Plenary 1

09:20 - 10:20 **Sustained Hypersonic Flight – It's harder than Rocket Science**
Michael Smart, The University of Queensland, Australia

10:20 - 10:50 Coffee break

Session 1: Synthesis and Processing

Session Chair: Laura Silvestroni, National Research Council of Italy, Italy

10:50 - 11:10 **Properties of HfC-SiC nano composites prepared using reactive spark plasma sintering**
Sea Hoon Lee, Korea Institute of Materials Science, South Korea

11:10 - 11:30 **Processing and Characterisation of (Ta,Hf)C Ultra-High Temperature Ceramics**
William E. Lee, Imperial College London, United Kingdom

11:30 - 11:50 **Synthesis and Static Oxidation Testing of Doped HfB₂ Powders**
Jon Binner, University of Birmingham, United Kingdom

11:50 - 12:20 Session 1 Discussion

12:20 - 13:30 Lunch

13:30 - 15:00 Free time/ad hoc discussion

Session 2: Characterization

Session Chair: William E. Lee, Imperial College London, United Kingdom

15:00 - 15:40 **Keynote 1**
Ultra-High Temperature Mechanical Properties of Zirconium Diboride-Based Ceramics
William Fahrenholtz, Missouri University of Science and Technology, USA

15:40 - 16:10 Coffee break

16:10 - 16:30 **Invited 1**
UHTC Development: Impact of Modern Characterisation Techniques
Daniel Riley, Institute of Materials Engineering, ANSTO, Australia

16:30 - 16:50 **A Diffusion-Based Oxidation and Multi Crack Growth Model to Predict Damage in Ultra-High Temperature Ceramics**
Michele Pettina', Imperial College London, United Kingdom

Monday, April 13, 2015 (continued)

16:50 - 17:10	High Temperature Ablation Rig Testing (HiTAR) Sam Moricca, Australian Nuclear Science and Technology Organisation, Defence Materials Technology Centre, Australia
17:10 - 17:30	Session 2 Discussion
18:00 - 20:00	Dinner
20:00 - 21:00	Poster Session/Social Hour

Tuesday, April 14, 2015

Breakfast (Deja View Restaurant): Opens 06:30

Session 3: Barriers/Coatings/Porous

Session Chair: Eric Wuchina, Naval Surface Warfare Center, USA

09:20 - 10:00

Keynote 2

Boride-carbide Systems: From UHTCs to CMCs

Carlos G. Levi, UCSB, USA

10:00 - 10:20

Characterization of Ultra High Temperature Ceramic Coatings Deposited by Vacuum Plasma Spraying

Yeon Woo Yoo, Korea Institute of Materials Science, South Korea

10:20 - 10:50

Coffee break

10:50 - 11:10

New Thermal Barrier Coatings for Advanced Turbine Engines

Hongbo Guo, Beihang University, China

11:10 - 11:30

The Effect of Substrate Geometry Variations on the Formation and Topographical Properties of Plasma Sprayed Thermal Barrier Coatings

Mitchell L. Sesso, Swinburne University of Technology, Australia

11:30 - 11:50

Orientation and Stress Relationship between Thermally Grown Rutile and Alumina formed during High Temperature Oxidation

Robbie J. Bennett, Cambridge University, United Kingdom

11:50 - 12:10

Near-Net-Shaping and Microstructure-Properties Modelling of Multi-Scale Porous UHTC

Carolina Tallon, The University of Melbourne, Australia

12:10 - 12:30

Session 3 Discussion

12:30 - 13:30

Lunch

13:30 - 15:30

Free time/ad hoc discussion

Session 4: Phase Stability

Session Chair: Noritaka Saito, Kyushu University, Japan

15:30 - 16:10

Keynote 3

Metal-rich Ceramic Phase Stability and Microstructures in Group IV and V Carbides and Nitrides

Gregory B. Thompson, University of Alabama, USA

16:10 - 16:40

Coffee break

16:40 - 17:00

Phase diagrams in the system boron-carbon-hafnium-zirconium

Theresa Davey, Imperial College London, United Kingdom

17:00 - 17:20

In situ, high temperature, synchrotron studies on the oxidation of ZrB₂ and composites

Pankaj Sarin, Oklahoma State University, USA

Tuesday, April 14, 2015 (continued)

- | | |
|---------------|---|
| 17:20 - 17:40 | Slip Regulation in Rocksalt Transition Metal Carbides
Nicholas DeLeon, The University of Alabama, USA |
| 17:40 - 18:00 | Session 4 Discussion |
| 18:00 | Dinner on own |

Wednesday, April 15, 2015

Breakfast (Deja View Restaurant): Opens 06:30

Session 5: Fibers/Composites

Session Chair: Jon Binner, University of Birmingham, United Kingdom

09:00 - 10:00

Plenary 2

UHTCMCs: short vs continuous fibers

Laura Silvestroni, National Research Council of Italy, CNR-ISTEC, Italy

10:00 - 10:20

Application of Coatings for Fiber Protection in ZrB₂ Based UHTCMC Structures for Hypersonic Flight

Marius Nelson Kuetemeyer, DLR, Germany

10:20 - 10:40

Development and Environment Relevant Testing of Ultra High Temperature Ceramic Matrix Composites based on Airbus Group C/SiC "SICARBON(TM)"

Stephan Schmidt-Wimmer, Airbus Defence & Space, Germany

10:40 - 11:10

Coffee break

Session Chair: William Fahrenholtz, Missouri University of Science and Technology, USA

11:10 - 11:30

An oxidation kinetic analysis of hot pressed zirconium carbide at high temperature

Claudia Gasparrini, Imperial College London, United Kingdom

11:30 - 12:10

Keynote 4

UHTC Composites: Processing, Performance and Future

Jon Binner, University of Birmingham, United Kingdom

12:10 - 12:30

Session 5 Discussion

12:30 - 19:00

Box Lunch/Optional Excursion/Free Time

19:00 – 22:00

Conference Banquet

Dinner Speaker

Mark Hodges, Defence Materials Technology Centre (DMTC), Australia

Thursday, April 16, 2015

Breakfast (Deja View Restaurant): Opens 06:30

Session 6: Joining

Session Chair: Gregory Thompson, University of Alabama, USA

09:00 - 09:40

Keynote 5

Joining of UHTC Boride Composites using Metallic Interlayer

Noritaka Saito, Kyushu University, Japan

09:40 - 10:00

Effect of Ni-Nb Interlayer Thickness on Mechanical Property of HfB₂ Composite Joints

Kou Honda, Kyushu University, Japan

10:00 - 10:20

Session 6 Discussion

10:20 - 10:50

Coffee break

10:50 - 11:50

Wrap-up and planning

11:50

Box lunch and departures

Poster Presentations List

Poster Session Monday, 13 April, 2015, 20.00-21.00

1. **Application of spark plasma sintering for the synthesis of nano UHTC powders**
Sea Hoon Lee, Korea Institute of Materials Science, South Korea
2. **Analysis of polycarbosilane precursors for the precursor impregnation and pyrolysis process**
Sea Hoon Lee, Korea Institute of Materials Science, South Korea
3. **Plasticity mechanisms in hafnium nitride at room and elevated temperature**
Katherine Vinson, The University of Alabama, USA
4. **The effect mechanism of photon radiation on the heat insulation performance in ceramic thermal barrier coating at elevated temperature**
Yue Ma, Beihang University, China
5. **A pressureless sintering process for preparing ultra-high temperature ZrB₂-SiC ceramics**
Qi Li, Beijing Institute of Aeronautical Materials, China
6. **Thermal transport properties of InFeZnO₄-YbFeZnO₄ solid solutions**
Yanling Pei, Beihang University, China