***Preliminary Program***

*(January 31, 2020)*

# ULTRA-HIGH TEMPERATURE CERAMICS: MATERIALS FOR EXTREME ENVIRONMENT APPLICATIONS V

**June 7-10, 2020**

[**The Cliff Lodge**](https://www.snowbird.com/lodging/the-cliff-lodge/) **at Snowbird**

**Snowbird, Utah**

**Conference Co-Chairs**

**Daniel Butts**

MACH-20, LLC, USA

**Carmen Carney**

Air Force Research Laboratory, USA

**Carolina Tallon**

Virginia Tech, USA

**Gregory Thompson**

University of Alabama, USA

**Chris Weinberger**

Colorado State University, USA



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**Engineering Conferences International**

**32 Broadway, Suite 314 - New York, NY 10004, USA**

**www.engconfintl.org –** [**info@engconfintl.org**](mailto:info@engconfintl.org)

**Sunday, June 7, 2020**

15:00 – 16:45 Registration opens

16:45 – 17:00 Opening remarks

17:00 – 18:00 **Plenary – Solar Probe**

Elizabeth Congdon, Johns Hopkins University Applied Physics Laboratory, USA

18:00 – 20:30 Welcome reception followed by Dinner

**Monday, June 8, 2020**

07:00 – 08:00 Breakfast

**Session:** **Processing & Properties**

**Chairs:** **Daniel Butts, MACH-20, LLC, USA**

08:00 – 08:30 **Historic activity and the ECI conferences**

William Fahrenholtz, Missouri University of Science and Technology, USA

08:30– 09:50 **The zeta phase in the transition metal carbides and nitrides: Structure, microstructure and properties**

Christopher Weinberger, Colorado State University, USA

08:50 – 09:10 **Effect of LaB6 addition on densification and compressive creep behavior of spark plasma sintered ZrB2-SiC based ultra-high temperature composites**

Rahul Mitra, Indian Institute of Technology Kharagpur, India

09:10 – 09:30 **TBD**

Carolina Tallon, Virginia Tech, USA

09:30 – 09:50 **Carbon influence on the fracture toughness of transition metal carbides**

Xingyuan Zhao, Colorado School of Mines, USA

09:50 – 10:20 Coffee Break

10:20 – 10:50 **TBD**

William Carter, DARPA DSO

10:50 – 11:10 **Optimizing magnesiothermic reduction route for synthesis of zirconium diboride**

Evgeny Shafirovich, The University of Texas at El Paso, USA

11:10 – 11:30 **Super-hard B6C ceramics fabricated through the laser-floating zone method**

Bibi Malmal Moshtaghioun, CSIC-University of Zaragoza, Spain

11:30 – 11:50 **Unexpected law for grain growth in twinned boron carbide ceramics fabricated under electric field**

Diego Gomez Garcia, CSIC-University of Seville, Spain

11:50 – 12:10 Discussion

12:10 – 13:30 Lunch

**Session:** **Processing & Properties**

**Chairs: Carmen Carney, Air Force Research Laboratory, USA**

13:30 – 14:00 **Experimental techniques to study structure and thermodynamics at ultra-high temperatures**

Sergey V. Ushakov, University of California at Davis, USA

14:00 – 14:20 **Atomistic modeling of kinking nonlinear elasticity in MAX phases**

Gabriel Plummer, Colorado School of Mines, USA

**Monday, June 8, 2020 (continued)**

14:20 – 14:40 **Application of atom probe tomography to ultrahigh temperature ceramics: Opportunities and challenges**

GregoryThompson, University of Alabama, USA

14:40 – 15:00 **Morphological control of tantalum carbide nanoparticles through surface dopant chemistry**

Olivia A. Graeve, University of California, San Diego, USA

15:00 – 15:30 Coffee Break

15:30 – 15:50 **ICME-based design of tooling for friction stir technologies on steels**

Qiaofu Zhang, QuesTek Innovations LLC, USA

15:50 – 16:10 **New ceramic heating elements based on zirconium carbide**

Hans-Peter Martin, Fraunhofer IKTS, Germany

16:10 – 16:30 **Characterization of ultra-high temperature materials produced by rapid-laser chemical vapor deposition (R-LCVD)**

Shay Harrison, Free Form Fibers, USA

16:30 – 17:00 Poster Introductions

17:00 – 20:00 Poster Session with heavy hors d'oeuvres and wine/beer/soft drinks

**Tuesday, June 9, 2020**

07:00 – 08:00 Breakfast

**Session: UHTC-CMCs**

**Chairs:** **Mike Cinibulk, Air Force Research Laboratory, USA**

08:00 – 08:30 **Advances and challenges in the development of UHTCMCs**

Diletta Sciti, ISTEC-CNR, Italy

08:30 – 09:00 **Investigation of new ceramic composites in relevant ultra-high-temperature environment for aerospace applications**

Raffaele Savino, University of Naples Federico II, Italy

09:00 – 09:20 **Development, processing and testing of continuous carbon fiber reinforced ceramic matrix composites for aerospace applications**

Maximilian Hoeck, ArianeGroup GmbH, Germany

09:20 – 09:40 **Effect of group IIIA rare earth oxides on the microstructure and thermo-mechanical properties of carbon fiber reinforced ZrB2/SiC composites**

Antonio Vinci, ISTEC - CNR, Italy

09:40 – 10:10 Coffee Break

10:10 – 10:40 **The effect of composition on performance for Cf/UHTCMCs containing ZrB2/HfB2 UHTC mixtures**

Jon Binner, University of Birmingham, United Kingdom

10:40 – 11:00 **Thermal ablation behavior of ultra-high temperature ceramic matrix composites through RF enhanced chemical vapor infiltration**

Vinothini Venkatachalam, University of Birmingham, United Kingdom

11:00 – 11:20 **High-Temperature Mechanical Characterization of UHTCMCs**

Thomas Reimer, Deutsches Zentrum für Luft- und Raumfahrt, Germany

11:20 – 11:40 **Novel polymer-derived carbide and boride refractory ceramics**

Zlatomir Apostolov, Air Force Research Laboratory, USA

11:40 – 12:00 Discussion

12:00 – 15:10 Boxed Lunch

Group trip on the aerial tram - information on the meeting place and post tram ride activities will be available at Sunday check-in.

**Session: Near Net Shape Processing**

**Chairs:** **Chris Weinberger, Colorado State University, USA**

15:10 – 15:30 **Tough, near-net shaped ultra-high temperature ceramic composites (UHTCMCs) via additive manufacturing**

Lisa Rueschhoff, Air Force Research Laboratory, USA

15:30 – 15:50 **Particle stabilized emulsions as pastes for 3d printing multi-scale porous UHT ceramics**

John Thornton, Defense Science and Technology Group, Australia

**Tuesday, June 9, 2020 (continued)**

15:50 – 16:10 **Direct ink writing of ultra-high temperature ceramics**

Swetha Chandrasekaran, Lawrence Livermore National Laboratory, USA

16:10 – 16:30 **Toward complex component manufacture via 3D printing and joining of parts**

Iuliia S. Elizarova, Imperial College London, United Kingdom

16:30 – 16:50 **Fracture property analysis of lightweight ceramic spheres manufactured via binder jetting printing**

Bhargavi Mummareddy, Youngstown State University, USA

16:50 – 17:10 **Low toxicity gelcasting of zirconium diboride**

Amy Wat, Lawrence Livermore National Laboratory, USA

17:10 – 17:20 Discussion

17:20 – 18:00 Break

18:00 – 20:00 Conference dinner

**Wednesday, June 10, 2020**

07:00 – 08:00 Breakfast

**Session:** **Relevant testing**

**Chairs:** **Greg Thompson, University of Alabama, USA**

08:00 – 08:30 **Thermal stability of UHTCs under laser heating**

Frederic Monteverde, National Research Council of Italy - Institute of Science and Technology for Ceramics, Italy

08:30 – 09:00 **Diagnostics for improved understanding of test environment and material interactions to advance oxidation-degradation models of UHTCs**

Michael K. Cinibulk, Air Force Research Laboratory, USA

09:00 – 09:20 **Plasma wind tunnel testing of UHTC coated components for hypersonic applications**

Mario De Stefano Fumo, CIRA, Italy

09:20 – 09:40 **Characterization & testing in extreme, applicable environments**

Bhavesh V. Patel, Southern Research Institute, USA

09:40 – 10:00 Coffee Break

**Session:** **Engineering Oxidation Resistance**

**Chairs: Frederic Monteverde, ISTEC-CNR, Italy**

10:00 – 10:30 **Preferential oxidation of high-entropy Ultra-high temperature ceramics**

Elizabeth Opila, University of Virginia, USA

10:30 – 10:50 **Discovery of novel high-entropy ceramics via machine learning**

Kenneth S. Vecchio, University of California San Diego, USA

10:50 – 11:10 **Preferential oxidation of high-entropy ultra-high temperature ceramics**

Lavina Backman, University of Virginia, USA

11:10 – 11:30 **Influence of thermal transport properties on the mechanism and power density at failure of high entropy carbides**

Kathleen Quiambao-Tomko, University of Virginia, USA

11:30 – 11:50 **Oxidation protection of ultra-high temperature ceramics using transpiration cooling**

Marc Ewenz Rocher, University of Oxford, United Kingdom

11:50 – 12:20 **Ultra-high temperature ceramics for transpiration cooling applications in hypersonic vehicles**

Matthew McGilvray, University of Oxford, United Kingdom

12:20 – 13:30 Lunch and Awards