Preliminary Program

(DRAFT-April 04, 2022)

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

June 5-8, 2022

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

Engineering Conferences International
32 Broadway, Suite 314 - New York, NY 10004, USA
www.engconfintl.org – info@engconfintl.org

Sunday, June 5, 2022

15:00 – 16:45	Registration opens
16:45 – 17:00	Opening remarks
17:00 – 18:00	**Plenary – Parker Solar Probe** Elizabeth Congdon, Johns Hopkins University Applied Physics Laboratory (JHU/APL), USA
18:00 – 20:30	Welcome reception followed by Dinner

Monday, June 6, 2022

07:00 – 08:00	**Breakfast**
	Session: Processing & Properties Chairs: **TBD**
08:00 – 08:05	**Conference Welcome and Expectations** Carmen Carney, Air Force Research Laboratory, USA
08:05 – 08:25	**Investigation of the oxidation resistance of ZrB_2-based monoliths using polymer-derived Si(Zr,B)CN as sintering aid** Nils-Christian Petry, DECHEMA-Forschungsinstitut, Germany
08:25 – 08:45	**The zeta phase in the transition metal carbides and nitrides: Structure, microstructure and properties** Christopher Weinberger, Colorado State University, USA
08:45 – 09:05	**Compressive creep behavior of spark plasma sintered ZrB_2-SiC-LaB_6 composites** Rahul Mitra, Indian Institute of Technology, Kharagpu, India
09:05 – 09:25	**The role of porosity on pressureless sintered TiB_2 tapes** Kaitlyn Shirey, Virginia Tech, USA
09:25 – 09:45	**Plasticity of ZrB_2 grains during micropillar compression: The effect of anisotropy, temperature and dislocations** Tamás Csanádi, Institute of Materials Research, Slovakia
09:45 – 10:15	**Coffee Break**
10:15 – 10:35	**Highly Stable Nanolamellar MXene-derived Carbides by Phase Transformation of Ti_3C2T_x and $Mo_2TiC_2T_x$ MXenes** Babak Anasori, Indiana University-Purdue University Indianapolis, USA
10:35 – 10:55	**Interfacial microstructure and mechanical behavior of spark plasma joined HfB_2-ZrB_2 based composites using Ni interlayer** Shipra Bajpai, Indian Institute of Technology, Kanpur, India
10:55 – 11:15	**Tungsten diboride for high energy nuclear applications** James Davidson, Imperial College London, United Kingdom
11:15 – 11:35	**Carbon influence on the fracture toughness of transition metal carbides** Xingyuan Zhao, Colorado School of Mines, USA
11:35 – 11:55	**Discussion**
11:55 – 13:00	**Lunch**
	Session: Fundamental Properties Chairs: **TBD**
13:00 – 13:20	**Experimental techniques to study structure and thermodynamics at ultra-high temperatures** Sergey V. Ushakov, Arizona State University, USA

Monday, June 6, 2022 (continued)

13:20 – 13:40	***In-situ* high temperature spatially resolved X-ray diffraction of TiB_2 up to ~3250 ˚C** Scott McCormack, University of California, Davis, USA
13:40 – 14:00	**Ordering of vacancies in zirconium carbide as a function of temperature and oxygen concentration** Theresa Davey, Tohoku University, Japan
14:00 – 14:20	**Design of Ultra-High Temperature Ceramics for Oxidation Resistance** Niquana Smith, University of Virginia, USA
14:20 – 14:40	**Atomistic Modeling of Kinking Nonlinear Elasticity in MAX Phases** Gabriel Plummer, Colorado School of Mines, USA
14:40 – 15:00	**Short-range chemical environment versus long-range chemical homogeneity analyses in high-entropy transition metal AlB_2-type diboride solid solutions** Frederic Monteverde, CNR-ISTEC, Italy
15:00 – 15:30	**Coffee Break**
15:30 – 15:50	**First-principles prediction of thermal conductivity of zirconium carbide and hafnium carbide at ultra-high temperatures** Tianli Feng, University of Utah, USA
15:50 – 16:10	**From the atomic scale to the bulk: Ultra high temperature evaluation of metal diborides MB_2 (M = Ta, Ti, Hf, Zr, Nb)** Elizabeth Sobalvarro Converse, Lawrence Livermore National Laboratory, USA
16:10 – 16:30	**Modeling environmental effects in MeB_2/SiC UHTCs: Oxidation by oxygen and water vapor** Pavel Mogilevsky, UES Inc., USA
16:30 – 16:50	**Stress distribution analysis in zirconium diboride and silica carbide(ZrB_2-SiC) based thermal protection system under hypersonic flight conditions using a machine learning driven approach** Carmine Zuccarini, Kingston University London, United Kingdom
16:50 – 17:00	**Break**
17:00 – 20:00	Poster Session with heavy hors d'oeuvres and wine/beer/soft drinks

Tuesday, June 7, 2022

07:00 – 08:00	**Breakfast**
	Session: UHTC-CMCs & Coatings Chairs: **TBD**
08:00 – 08:20	**Advances and challenges in the development of UHTCMCs - A review of the C3harme project** Diletta Sciti, ISTEC-CNR, Italy
08:20 – 08:40	**The AM3aC2A Project: Multiscale approach for modeling CMC and UHTCMC materials for reusable components for aerospace** Mario De Stefano Fumo, Italian Aerospace Research Centre, Italy
08:40 – 09:00	**Influence of Nb coating on the oxidation behavior of ZrB_2** Jan Erik Förster, German Aerospace Center, Germany
09:00 – 09:20	**Suspension plasma spraying of zirconium diboride** Alex Lynam, University of Nottingham, United Kingdom
09:20 – 09:40	**Laser additive manufacturing of ultra high temperature ceramics** Steven Storck, Johns Hopkins University-Applied Physics Laboratory, USA
09:40 – 10:10	**Coffee Break**
10:10 – 10:30	**Thermal ablation behaviour of ultra-high temperature ceramic matrix composites made by RF enhanced chemical vapour infiltration** Jon Binner, University of Birmingham, United Kingdom
10:30 – 10:50	**Thermodynamic and experimental SiC-ZrC CVD process development** Benjamin Lamm, Oak Ridge National Laboratory, USA
10:50 – 11:10	**High-Temperature mechanical characterization of UHTCMCs** Thomas Reimer, Deutsches Zentrum für Luft- und Raumfahrt, Germany
11:10 – 11:30	**UHTC coatings obtained by plasma spraying: Characterization and oxidation behavior** Arthur Charrue, CEA-DAM Le Ripault, France
11:30 – 11:50	**Computational model of zirconium carbide carbon fiber composite oxidation under hypersonic conditions** Allison Rzepka. UIUC Department of Mechanical Science and Engineering, USA
11:50 – 12:10	**Oxidation behavior of Cf / MC – MB_2 – SiC (with M = Hf, Zr) composites in an oxyacetylene torch environment** Thomas Bourdeau, Laboratory for thermo-structural composites LCTS , France
12:10 – 15:30	**Lunch / Free time**
	Session: Near Net Shape Processing Chairs: **TBD**
15:30 – 15:50	**Additive manufacturing of chopped fiber ultra-high ceramic composites** James Kemp, UES, Inc., USA

Tuesday, June 7, 2022 (continued)

15:50 – 16:10	**Low-toxity gelcasting to 3D shaping of UHTCs** Julia Goyer, Virginia Tech, USA
16:10 – 16:30	**Direct ink writing of ultra-high temperature ceramics** Swetha Chandrasekaran, Lawrence Livermore National Laboratory, USA
16:30 – 16:50	**Additive manufacturing enabling W-SiC and W-ZrB2-SiC heterogeneous materials** David Mitchell, Oak Ridge National Laboratory, USA
16:50 – 17:10	**Discussion**
17:10 – 18:00	**Break**
18:00 – 20:00	**Conference Dinner**

Wednesday, June 8, 2022

07:00 – 08:00	**Breakfast**
	Session: Engineered Structures Chairs: **TBD**
08:00 – 08:20	**Ultra-high temperature ceramics for transpiration cooling applications in hypersonic vehicles** Matthew McGilvray, University of Oxford, United Kingdom
08:20 – 08:40	**Porous UHTCs for transpiration cooling of hypersonic flight** Rowan Hedgecock, Imperial College London, United Kingdom
08:40 – 09:00	**Ultra-high temperature ceramics with exceptional strength at elevated temperature** Laura Silvestroni, CNR-ISTEC, Italy
09:00 – 09:20	**Characterization of ultra-high temperature materials produced by rapid-laser chemical vapor deposition (R-LCVD)** Shay Harrison, Free Form Fibers, USA
09:20 – 09:40	**Integrated self-healing thermal protection for high-speed vehicles** Don King, Johns Hopkins University, Applied Physics Laboratory, USA
09:40 – 10:10	**Coffee Break**
	Session: Extreme Environment Testing Chairs: **TBD**
10:10 – 10:30	**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
10:30 – 10:50	**Plasma wind tunnel testing of UHTC coated components for hypersonic applications** Mario De Stefano Fumo, CIRA, Italy
10:50 – 11:10	**Characterization & testing in extreme, applicable environments** Bhavesh V. Patel, Southern Research Institute, USA
	Session: High Entropy Materials I Chairs: **TBD**
11:10 – 11:30	**Synthesis, densification, and properties of high entropy ultra-high temperature ceramics** William Fahrenholtz, Missouri University of Science and Technology, USA
11:30 – 11:50	**Synthesis and crystallography of high entropy metal carbides: A new class of ultrahigh temperature and irradiation resistant ceramics** Olivia A. Graeve, University of California, San Diego, USA
11:50 – 12:10	**Processing of high entropy carbide based ceramics** Lavina Backman, US Naval Research Laboratory, USA

Wednesday, June 8, 2022 (continued)

12:10 – 13:10	**Lunch**
	Session: High Entropy Materials II
13:10 – 13:30	**Oxidation of high entropy ultra-high temperature ceramics** Elizabeth Opila, University of Virginia, USA
13:30 – 13:50	**Mechanical and thermal properties of high-entropy boride ceramics** Lun Feng, Missouri University of Science and Technology, USA
13:50 – 14:10	**High Entropy Rare Earth $A_2b_2O_7$ Type Zirconates** Daniel R. Lowry, Sandia National Laboratories, USA
14:10 – 14:30	**Protective complex oxide film formation in multi-component ultra-high temperature carbides during plasma jet exposure** Ambreen Nisar, Florida International University, USA
14:30	**Announcement of the 2024 Conference and presentation of awards**