Monday, November 6, 2017

07:00 - 08:45 Breakfast

08:45 - 09:00 Opening Remarks
Conference Chair: Yutaka Kagawa
ECI Conference Technical Liaison: Ram Darolia

Session 1: Plenary Session
Session Chairs: Yutaka Kagawa and Ram Darolia

09:00 - 09:45 Keynote: Development and commercialization of GE’s ceramic matrix composites (CMCs) for aircraft engines .....1
Krishan Luthra, GE Global Research, USA

09:45 - 10:15 High temperature composite overview in France .....2
Marc Montaudon, Eric Bouillon, Safran Ceramics

10:15 - 10:45 Application of CMC materials into aero-engines .....3
Kuniyuki Imanari, IHI Corporation, Japan

10:45 - 11:15 Coffee break

11:15 - 11:45 ONR and NAVY Research in Ceramic Matrix composites systems for advanced naval engines .....4
David Shiffer, Office of Naval Research, USA

11:45 - 12:15 Overview of NASA transformational tools and technologies Project’s 2700°F CMC/EBC Technology Challenge .....5
Janet B. Hurst, NASA Glenn Research Center, USA

12:15 - 12:40 Ceramic matrix composites at GE Aviation .....6
Jim Steibel, General Electric Aviation, USA

12:40 - 14:00 Lunch break

Session 2: Integrated Design and Applications – 1
Session Chairs: Yutaka Kagawa and Dongming Zhu

14:00 - 14:25 Fiber creep and rupture models for design of advances high-temperature SiC-based ceramic matrix Composites .....7
James DiCarlo, NASA Glenn Research Center, USA

14:25 - 14:50 Progress of silicon carbide fibers and their application to ceramic matrix composites .....8
Michio Takeda, NGS Advanced Fibers Co., Ltd, Japan
Monday, November 6, 2017 (continued)

14:50 - 15:15  Ceramic composites for high temperature aerospace structures and propulsion systems .....9
David Marshall, University of Colorado, USA
Olivier Sudre, Teledyne Scientific Company, Thousand Oaks, CA; Brian Cox, Arachne Consulting, Sherman Oaks, CA

15:15 - 15:40  Twenty years of experience with carbon/ceramic brakes: Status and perspectives .....10
Walter Krenkel, University of Bayreuth, Germany

15:40 - 16:00  Coffee break

Session 2: Integrated Design and Applications – 2
Session Chairs: Dongming Zhu and Rishi Raj

16:00 - 16:25  Overview of ceramic matrix composite research at NASA Glenn Research Center .....11
James D. Kiser et al, NASA Glenn Research Center, USA

16:25 - 16:50  Informatics based structure-property linkages for transverse strength of ceramic matrix composites .....12
Dipen Patel, Triplicane Parthasarathy, Daniel Rapking, Michael Braginsky, Craig Przybyla, Air Force Research Laboratory, USA

16:50 - 17:15  Engineering framework for Safran interlocked ceramics components .....13
David Marsal, Eric Bouillon, Nicolas Laval, Safran Ceramics

17:15 - 17:40  SiC-based ceramic matrix composite behavior enhancement for gas turbines hot sections .....14
Eric Bouillon, Nicolas Laval, David Marsal, Safran Ceramics, France

17:40 - 18:05  Updated Composite Materials Handbook-17 (CMH-17) Volume 5 - Ceramic Matrix Composites .....15
James Doug Kiser, NASA Glenn Research Center, USA

18:30 - 20:00  Dinner

20:00 - 21:30  Poster Session/Social hour (Sponsored by CoorsTek, Inc.)
Tuesday, November 7, 2017

07:00 - 09:00  Breakfast

Session 3: Advanced Materials and Architectures, Interfaces and Composite System Performance
Session Chairs: Walter Krenkel and James D. Kiser

09:00 – 09:25  Constituent development for higher temperature capable ceramic matrix composites .....16
Michael K. Cinibulk, Air Force Research Laboratory, USA

09:25 – 09:50  Interface engineering in oxide/oxide composites .....17
K.K. Chawla, University of Alabama at Birmingham, USA

09:50 - 10:15  Creep durability of 3D woven SiC/SiC composites with (CVI+PIP) hybrid matrix .....18
R.T. Bhatt, OAI/NASA Glenn Research Center, USA

10:15 - 10:40  SiC fibers and SiC/SiC ceramic matrix minicomposites damage behavior .....19
Amjad Almansour, NASA Glenn Research Center, USA

10:40 - 11:10  Coffee break

11:10 - 11:35  Image analysis, synthesis and image-based modeling of ceramic-matrix composites .....20
Gerard L. Vignoles, University of Bordeaux, France

11:35 - 12:00  Effect of fiber distributions on the mechanical performance of CMC materials: Virtual manufacturing and testing approach .....21
Woosok Ji, Hye-gyu Kim, Ulsan National Institute of Science and Technology, Korea

12:00 - 12:25  Effect of mechanical machining on surface roughness of CMCs .....22
Ralf Goller, Achim Rösig, Augsburg University of Applied Sciences

12:30  Pick up boxed lunch

12:45  Buses depart for excursion to Optional Excursion to Bandelier National Monument followed by stop at Santa Fe Brewing Company (drinks on your own).

After excursion: Dinner on your own in Santa Fe
Wednesday, November 8 2017

07:00 - 09:00  Breakfast

Session 4: Processing and Mechanical Behavior, NDE, Modeling and Life Prediction
Session Chairs: Rishi Raj and Craig Przybyla

08:35 - 09:00  In-situ 3D visualization of composite microstructure during polymer-to-ceramic conversion .....23
Frank Zok, University of California Santa Barbara, USA

09:00 - 09:25  A methodology based on in-situ crack propagation and modeling for designing ceramic composites for use at high temperature .....24
Raj N. Singh, Oklahoma State University, USA

09:25 - 09:50  Virtual simulation and design of barrier coatings for ceramic composites .....25
Matthew R. Begley, University of California, Santa Barbara, USA

09:50 - 10:15  Multi-scale modeling of damage and delaminations failure in ceramic matrix composites .....26
Rajesh S. Kumar, UTRC/Pratt & Whitney, USA

10:15 - 10:40  Monitoring damage accumulation using acoustic emission and electrical resistance at room and elevated temperatures of SiC-based composites .....27
Greg Morscher, University of Akron, USA

10:40 - 11:00  Coffee break

Session 5: Polymer Derived Ceramics and Processing
Session Chairs: David Marshall and Greg Morscher

11:00 - 11:25  Dual function polymer-derived non-oxide/oxide matrix prepared by additive manufacturing .....28
Rishi Raj, University of Colorado, USA

11:25 - 11:50  Fundamentals of polymer precursor method for synthesizing silicon carbide based ceramic fibers .....29
Masaki Narisawa, Osaka Prefecture University; Yuka Ikemoto, Japan Synchrotron Radiation Research Institute; Kenji Suzuki, Advanced Institute of Materials Science, Japan

11:50 - 12:15  Implications of coupled crystallization and decomposition reactions for CMC processing using polymer derived ceramics .....30
David Poerschke, University of Minnesota, USA
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<td>Non-oxide ceramic matrix composites for application in hot gas atmospheres – requirements and potential .....32</td>
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<td>CMAS challenges to CMC-T/EBC systems .....36</td>
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<td>Issues of advanced ceramic matrix composites in aeroengine applications .....38</td>
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<td>Sung R. Choi, Naval Air Systems Command, Patuxent River, USA</td>
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<td>Calcium-magnesium alumino-silicates (CMAS) reaction mechanisms and resistance of advanced turbine environmental barrier coatings - SiC/SiC ceramic matrix composites .....39</td>
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<td>Dongming Zhu, Gustavo Costa, Bryan Harder, Valerie L. Wiesner, Janet B. Hurst NASA Glenn Research Center, USA</td>
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17:40 - 18:05 Degradation of oxide/Si/(SiC/SiC) model environmental barrier coatings system after unexpected melting condition of Si bond coat layer

Yutaka Kagawa, Yutaro Arai, Tokyo University of Technology, Japan

19:30 - 21:30 Conference Banquet
Thursday, November 9, 2017

07:00 - 09:00 Breakfast

Session 7: Environmental Barrier Coatings-1: Processing and Test Development
Session Chairs: Hagen Klemm and Kang Lee

09:00 - 09:25 Current EBC development and testing at NASA .....40
Kang Lee, Deborah Waters, Gustavo Costa, Bernadette Puleo, NASA GRC, USA

09:25 - 09:50 Advanced design of EBC based on mass-transfer mechanisms in oxides under oxygen potential gradients at high temperatures .....41
Satoshi Kitaoka, Tsuneaki Matsudaia, Masashi Wada, Taishi Yokoi, Masasuke Takata, Japan Fine Ceramics Center, Japan

09:50 - 10:15 APS Y2O3 environmental barrier coatings for oxide ceramic matrix composites .....42
Peter Mechnich, DLR, Germany

10:15 - 10:40 Development of NASA’s advanced environmental barrier coatings for SiC/SiC composites: Prime-reliant design and durability perspectives .....43
Dongming Zhu, NASA GRC, USA

10:40 - 11:00 Coffee break

Session 7: Environmental Barrier Coatings-2: Mechanics and Failure mechanisms
Session Chairs: Hideki Kakisawa and Peter Mechnich

11:00 - 11:25 Delamination resistance of oxide environmental barrier coatings from SiC/SiC substrate .....44
Yutaka Kagawa, Tokyo University of Technology, Japan

11:25 - 11:50 Failure resistant thermal and environmental barrier coating concepts .....45
Haydn Wadley, University of Virginia, USA

11:50 - 12:15 An evaluation method for interface toughness of environmental barrier coatings (EBCs) on ceramic matrix composites (CMCs) .....46
Hideki Kakisawa, National Institute for Materials Science, Japan

12:15 - 12:40 Development of thermally sprayed environmental barrier coatings .....47
Emine Bakan, Caren Sophia Gatzen, Daniel Emil Mack, Robert Vaßen, Forschungszentrum Jülich GmbH, Germany

12:40 - 14:00 Lunch and Departures
Poster Presentations

1. Residual stress measurement of YB silicates by Raman Spectroscopy: First-principles and experimental studies .....48
   Takafumi Ogawa ¹, Yoshihisa Tanaka ², Taishi Yoko ¹,Hideki Kakisawa ², Satoshi Kitaoka ¹
   ¹Japan Fine Ceramics Center, Japan; ²National Institute of Materials Science, Japan

2. Oxidation mechanisms of ZRB₂-based ultra high temperature ceramic matrix composites .....49
   Ryo Inoue, Yasuo Kogo, Tokyo University of Science; Yuki Kubota, Ken Goto, Japan Aerospace Exploration Agency (JAXA)

3. Microstructure control of multi-layered EBC prepared by dual electron beam PVD .....50
   Taishi Yoko, Norio Yamaguchi, Satoshi Kitaoka, Masasuke Takata, Japan Fine Ceramics Center, Japan

4. Numerical simulation of energy release rate for interface crack initiation due to thermal stress in environmental barrier coatings for Silicon Carbide (SiC) fiber reinforced in SiC matrix composite .....51
   Emi Kawai, Yoshitaka UMENO, University of Tokyo, Japan

5. The potential of plasma activation for EB-PVD of EBC systems on CMC components .....52
   Burkhard Zimmermann, Gösta Mattausch, Frank-Holm Rögner, Bert Scheffel, Jens-Peter Heinß, Christoph Metzner, Fraunhofer Institute for Organic Electronics, Germany

6. SIC/SIC composite thruster for a non-toxic liquid propellant rocket engine .....53
   Ken Goto, Shinichiro Tokudome, Tsuyoshi Yagishita, Japan Aerospace Exploration Agency, Japan

7. Measurement of delamination toughness of EBC layer from 2D/3D SIC/SIC substrate: Experiment and analysis .....54
   Yuto Aoki, Junya Inoue, Yutaka Kagawa, Tokyo University of Technology, Japan

8. How not to measure the tensile strength of high-modulus fibers .....55
   Joseph Pegna, Shay L. Harrison, Free Form Fibers, USA

   Shay Harrison, Joseph Pegna, Free Form Fibers, USA

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11. High-temperature ceramic matrix composites using microwave enhanced chemical vapor infiltration .....57
    Matthew Porter, University of Birmingham, United Kingdom

12. Interfacial characteristics and microstructural evolution of ceramics exposed to high temperature sand laden combustion environments .....58
    Dongming Zhu, NASA Glenn Research Center, USA

13. Environmental barrier coating fracture, fatigue and high-heat-flux environment failure mechanisms and stochastic progressive damage simulation .....59
    Dongming Zhu, Noel Nemeth, NASA Glenn Research Center, USA