Symposium 4: Armor Ceramics
Monday, January 28, 2013
Transparent Ceramics & Glasses

1:30 PM-6:10 PM
Room: Coquina Salon E
Session Chair(s): Parimal Patel, Jane Adams

1:30 PM
(ICACC-S4-001-2013) Mechanical Behaviors and Structure of Glass (Invited Speaker)
Setsuro Ito*, Tokyo Institute of Technology, Japan

2:00 PM
(ICACC-S4-002-2013) Structure and Properties of Densified Glasses (Invited Speaker)
Liping Huang*, Rensselaer Polytechnic Institute, USA

2:30 PM
(ICACC-S4-003-2013) MD Simulations of Structure and Mechanical Properties of Silica Glasses (Invited Speaker)
Alastair Cormack*, Laura Adkins, Alfred University, USA

3:00 PM
Break

3:20 PM
(ICACC-S4-004-2013) Glass: A Highly Tunable and Versatile Material for Armor Applications
Mark J. Davis*, SCHOTT North America, Inc., USA

3:40 PM
(ICACC-S4-005-2013) Compression, release, and densification of borosilicate glass (Invited Speaker)
Michael Zellner*, Richard Becker, Dattaraya Dandekar, Army Research Laboratory, USA;
Christopher Morris, Los Alamos National Laboratory, USA

4:10 PM
(ICACC-S4-006-2013) Responses of Siliceous Materials to High Pressures
Andrew Wereszczak*, Timothy Morrissey, Mattison Ferber, Oak Ridge National Laboratory, USA; Kaye Bortle, Elliott Rodgers, ORISE, USA; Yogesh Vohra, University of Alabama - Birmingham, USA

4:30 PM
(ICACC-S4-007-2013) Damage Mechanisms of Chemically Strengthened Glass Bars Due to High-Velocity Ball Impact
Phillip Anthony Jannotti*, Ghatu Subhash, University of Florida, USA

4:50 PM
(ICACC-S4-008-2013) Modeling Multiple Impacts onto Glass Targets
Timothy Holmquist*, Southwest Research Institute, USA

5:10 PM
(ICACC-S4-009-2013) Brittle fracture evolution in projectile impact on a glass laminate: comparison between experiments and peridynamics results
Florin Bobaru*, Wenke Hu, University of Nebraska-Lincoln, USA; Jian Yu, Chian-Fong Yen, ARL, USA

5:30 PM
(ICACC-S4-010-2013) Multiscale Modeling of Non-crystalline Ceramics (Glass)
George A. Gazonas*, James W McCauley, Parimal Patel, U.S. Army Research Laboratory, USA

5:50 PM
(ICACC-S4-011-2013) Quantum mechanical modeling of structure and elastic properties of AION
Iskander G Batyrev*, DeCarlos E Taylor, James W McCauley, George A Gazonas, Neil S Weingarten, Betsy M Rice, US Army Research Laboratory, USA
Tuesday, January 29, 2013
Brittle Materials Modeling
8:00 AM-10:10 AM
Room: Coquina Salon E
Session Chair(s): Brian Leavy

8:00 AM
(ICACC-S4-012-2013) Multiscale Modeling of Brittle Fracture with Peridynamics (Invited Speaker)
Stewart A Silling*, Sandia National Laboratories, USA

8:30 AM
(ICACC-S4-013-2013) Constitutive and Adaptive Kinematic Modelling of Dynamic Fracture in Ceramic Armour
Nik Petrinic*, Simone Falco, Ettore Barbieri, Sascha Knell, Emilio López-López, University of Oxford, United Kingdom; Teresa Rodriguez Suarez, Universidad de Oviedo, Spain; Richard I Todd, University of Oxford, United Kingdom

8:50 AM
(ICACC-S4-014-2013) 3D Mechanism-Based Modeling of the Failure of Brittle Materials under Dynamic Multiaxial Loading
Guangli Hu*, Kaliat Ramesh, Johns Hopkins University, USA

9:10 AM
(ICACC-S4-015-2013) Simulations of Edge-on Impact (EOI) using a micromechanics damage model
Andrew Llewellyn Tonge*, Kaliat T Ramesh, The Johns Hopkins University, USA

9:30 AM
(ICACC-S4-016-2013) Current Numerical Efforts on Predicting the Ballistic Impact of W-Based Penetrators on Confined Hot-Pressed Boron Carbide Targets Behavior
Costas G Fountzoulas*, Jerry C LaSalvia, WMRD, USA

9:50 AM
Break

Materials in Extreme Dynamic Environments (MEDE)
10:10 AM-12:00 PM
Room: Coquina Salon E
Session Chair(s): James McCauley

10:10 AM
Opening Remarks

10:20 AM
(ICACC-S4-017-2013) Materials in Extreme Dynamic Environments - A Collaborative Research Alliance (CRA) (Invited Speaker)
John H Beatty*, US Army Research Laboratory, USA; K. T Ramesh, Johns Hopkins University, USA

10:40 AM
(ICACC-S4-018-2013) Armor Ceramics in Extreme Dynamic Environments (Invited Speaker)
K. T. Ramesh*, Johns Hopkins Univ, USA

11:10 AM
(ICACC-S4-019-2013) Materials in Extreme Dynamic Environments (MEDE)- The Opportunities for Boron Carbide as the Next Generation Armor Material (Invited Speaker)
Richard Haber*, Rutgers University, USA

11:40 AM
Panel Question & Answer Session

Boron-Icosahedral Based Ceramics I
1:20 PM-5:10 PM
Room: Coquina Salon E
Session Chair(s): Jerry LaSalvia

1:20 PM
(ICACC-S4-020-2013) Electronic Structures of
Boron Crystals (Invited Speaker)
Koun Shirai*, ISIR, Osaka University, Japan

1:50 PM
(ICACC-S4-021-2013) Failure and Phase Transformation in Boron Carbide from a Shock Physics Perspective (Invited Speaker)
Dennis Grady*, Applied Research Associates, USA

2:30 PM
(ICACC-S4-022-2013) A brief review of deformation induced amorphization of boron carbide (Invited Speaker)
Mingwei Chen*, Tohoku University, Japan

3:00 PM
Break

3:20 PM
(ICACC-S4-023-2013) Stoichiometry effects on the mechanical properties of icosahedral boron carbide under load (Invited Speaker)
DeCarlos Taylor*, James W McCauley, Army Research Laboratory, USA

3:50 PM
(ICACC-S4-024-2013) Can We Truly Measure the Hardness of Crystalline Boron Carbide? - New Insights into the Spatial Distribution of Amorphized Zone
Ghatu Subhash*, University of Florida, USA

4:10 PM
(ICACC-S4-025-2013) Indentation Size Effect in Boron Carbide
Eugene Shanboltz*, Jerry C LaSalvia, Kristopher D Behler, U.S. Army Research Lab, USA; Vlad Domnich, Rutgers University, USA

4:30 PM
(ICACC-S4-026-2013) Characterization of the Hardness-Load Dependence of Boron Suboxide
Jerry C. LaSalvia, U.S. Army Research Laboratory, USA; Vladislav Domnich, Rutgers, The State University of New Jersey, USA; Robert Pavlacka*, Eugene R Shanboltz, Kristopher D Behler, U.S. Army Research Laboratory, USA

4:50 PM
(ICACC-S4-027-2013) Structural Instability of Boron Carbide Under High-Velocity Impact
Vladislav Domnich*, Rutgers University, USA; Jerry C LaSalvia, Eugene R Shanboltz, U.S. Army Research Laboratory, USA; Richard A Haber, Rutgers University, USA

Wednesday, January 30, 2013
Boron-Icosahedral Based Ceramics II

8:00 AM-9:50 AM
Room: Coquina Salon E
Session Chair(s): Jane Adams

8:00 AM
(ICACC-S4-028-2013) Consequences of Amorphization on Boride Carbide Ballistic Performance (Invited Speaker)
Michael Joseph Normandia*, Ceradyne, USA

8:30 AM
(ICACC-S4-029-2013) Armour research at FOI on boron carbide
Patrik Lundberg*, Defence & Security, Systems and Technology Division, Sweden

8:50 AM
(ICACC-S4-030-2013) Edge-on Impact investigation of fracture propagation in Boron Carbide
Elmar Strassburger*, Fraunhofer EMI, Germany

9:10 AM
(ICACC-S4-031-2013) Intact and predamaged boron carbide strength under moderate confinement pressures
Isaais Sidney Chocron, Charles E Anderson*, Kathryn A Dannemann, Arthur E Nicholls, Nikki L King, Southwest Research Inst, USA

9:30 AM
Break
Quasi-Static and Dynamic Behavior I
9:50 AM-12:00 PM
Room: Coquina Salon E
Session Chair(s): Sikhanda Satapathy

9:50 AM
(ICACC-S4-032-2013) Pressure and Shear Induced Phase Transformations in Ceramics (Invited Speaker)
Valery I. Levitas*, Iowa State University, USA

10:20 AM
(ICACC-S4-033-2013) Raman Characterization of Ballistically-Impacted Polycrystalline 3C and 6H Silicon Carbides
Jerry C. LaSalvia*, U.S. Army Research Laboratory, USA; Vladislav Domnich, Rutgers, The State University of New Jersey, USA; Kristopher D Behler, Eugene R Shanholtz, U.S. Army Research Laboratory, USA

10:40 AM
(ICACC-S4-034-2013) Thermal Effects in Extreme Dynamic Environments
Mark J. Davis*, SCHOTT North America, Inc., USA

11:00 AM
(ICACC-S4-035-2013) Shock experiments to study source of inelasticity in ceramics
Sikhanda Satapathy*, Dattatraya Dandekar, Cyril Williams, US Army Research Laboratory, USA

11:20 AM
(ICACC-S4-036-2013) Effect of Prestressing on the Ballistic Performance of Alumina Ceramics: Experiments and Modeling
Aaron H. Gassman*, Vitaly Paris, Lev Levin, Zvi Asaf, Avi Ya'akovbovich, Eylam Ran, Felix Aizik, Plasan Sasa Ltd., Israel

11:40 AM
(ICACC-S4-037-2013) Comparison of interface response of different ceramic microstructures to high strain rate indentation
Emilio Lopez Lopez, Simone Falco, University of Oxford, United Kingdom; Santonu Ghosh, Loughborough University, United Kingdom; Teresa Rodriguez Suarez, Claire Dancer, University of Oxford, United Kingdom; Houzheng Wu, Loughborough University, United Kingdom; Nik Petrinic, Richard I Todd*, University of Oxford, United Kingdom

Quasi-Static and Dynamic Behavior II
1:20 PM-4:20 PM
Room: Coquina Salon E
Session Chair(s): Sikhanda Satapathy

1:20 PM
(ICACC-S4-038-2013) Effect of zirconia phase transformation on the high strain rate performance of nano zirconia toughened alumina
Shuo Huang*, Jon Binner, Sanotu Ghosh, Bala Vaidhyanathan, Houzheng Wu, Loughborough University, United Kingdom; Simone Falco, Nik Petrinic, Richard Todd, University of Oxford, United Kingdom

1:40 PM
(ICACC-S4-039-2013) Anisotropy, Damage and the Dynamic Piezoelectric Effect
Leslie Elise Lamberson*, Drexel University, USA; Eswar Korimilli, K. T Ramesh, Johns Hopkins University, USA

2:00 PM
(ICACC-S4-040-2013) Use of Brazilian disk test to determine the mechanical strength of laminated-ceramic composites
Christian J. Espinoza Santos*, John Lambros, Waltraud M Kriven, University of Illinois at Urbana-Champaign, USA

2:20 PM
(ICACC-S4-041-2013) Influence of porosity on the mechanical behavior of alumina/porous alumina laminates
Pathikumar Sellappan*, Waltraud M Kriven, John Lambros, University of Illinois at Urbana-Champaign, USA

ceramics using current activated pressure assisted densification (Invited Speaker)
Javier E Garay*, University of California, Riverside, USA

Thursday, January 31, 2013

Synthesis and Processing II
1:20 PM-3:50 PM
Room: Crystal Ballroom
Session Chair(s): Robert Pavlacka

1:20 PM
(ICAAC-S4-048-2013) Thermomechanical properties of nanocomposites of hafnia and silicon carbide (Invited Speaker)
Yutaka Shinoda*, Tokyo Institute of Technology, Japan; Rishi Raj, Department of Mechanical Engineering, USA; Fumihiro Wakai, Tokyo Institute of Technology, Japan

1:50 PM
(ICAAC-S4-049-2013) Comparison of armor ceramics made by spark plasma sintering (SPS) and pressureless sintering
Prashant Karandikar*, Stephen Wong, Matthew Duke, M Cubed Technologies, Inc., USA; Richard Haber, Minh Vu, Rutgers University, USA; Jogender Singh, Pennsylvania State University, USA

2:10 PM
(ICAAC-S4-050-2013) Pressureless sintering of silicon carbide - boron carbide composites
Luc Jean Vandeperre*, Jia Teo, Imperial College
London, United Kingdom

2:30 PM
(ICACC-S4-051-2013) Synthesis and Characterization of Submicron-Grained Boron Carbide
Chris Haines*, Darold Martin, Kendall Mills, Rajendra Sadangi, Deepak Kapoor, US Army ARDEC, USA

2:50 PM
Break

3:10 PM
(ICACC-S4-052-2013) Rapid Carbothermal Reduction Synthesis of Boron Carbide
Muhammet Fatih Toksoy*, William Rafaniello, Richard A Haber, Steve L Miller, Rutgers University, USA

3:30 PM
(ICACC-S4-053-2013) The Role of Interfaces on the Sintering, Microstructure Evolution, and Properties of Hot-Pressed Transparent MgAl2O4 Spinel
Marc Rubat du Merac, Technical University Darmstadt, Germany; Ivar Reimanis*, Colorado School of Mines, USA; Hans-Joachim Kleebe, Mathis Müller, Technical University Darmstadt, Germany

Non-Destructive Evaluation
3:50 PM-5:10 PM
Room: Crystal Ballroom
Session Chair(s): Matthew Bratcher

3:50 PM
(ICACC-S4-054-2013) Ultrasonic Nondestructive Characterization of Spark Plasma Sintered Silicon Carbide Microstructure
Vincent DeLucca*, Richard A Haber, Rutgers University, USA

4:10 PM
(ICACC-S4-055-2013) Nondestructive

Characterization of Low Velocity Impact Damage in Protective Ceramic Components
Raymond Brennan*, William Green, US Army Research Laboratory, USA

4:30 PM
(ICACC-S4-056-2013) Evaluation of Low Velocity Strike Damage in Ceramic Tile Modules Using a Microwave Interference Scanning System
William Howard Green*, Raymond Brennan, U.S. Army Research Laboratory, USA

4:50 PM
(ICACC-S4-057-2013) Portable Automated Microwave Interferometry Imaging in Complex Ceramics
Karl Schmidt*, Jack Little, Evisive, Inc., USA; William Ellingson, ERC Company, USA; Lisa P Franks, US Army Tank Automotive Research Development and Engineering Center, USA; William H Green, US Army Research Laboratory, USA

Tuesday, January 29, 2013
S4 Poster Session
5:30 PM-8:00 PM
Room: Ocean Center

(ICACC-S4-P053-2013) Indentation Behaviour in Spark Plasma Sintered SiC-B4C Ceramics
David Hallam*, Paul Smith, Julie Yeomans, University of Surrey, United Kingdom; Andrew Heaton, Bryn James, DSTL, United Kingdom

(ICACC-S4-P054-2013) Thermal Stability of Amorphous Boron Carbide Phase Formed Under Indentation
Vladislav Domnich*, Rutgers University, USA; Jerry C LaSalvia, Eugene R Shanhoitz, U.S. Army Research Laboratory, USA; Richard A Haber, Rutgers University, USA

(ICACC-S4-P055-2013) Characterization of the Amorphous Zone Beneath Static and Dynamic Vickers Indentations in Boron Carbide
Gregory Parsard*, Ghatu Subhash, University of
(ICACC-S4-P056-2013) Macoroscopic Assessment of High Pressure Failure of B4C and B4C/SiC Composites
Prashant Karandikar*, M Cubed Technologies, Inc., USA; Suzanne Horner, James Zheng, Program Executive Office - Soldier, US Army, USA

(ICACC-S4-P057-2013) Quantum Mechanical Study of Grain Boundaries in Boron Carbide
Todd D. Beaudet*, Army Research Laboratory, USA; John R Smith, Johns Hopkins University, USA; Jennifer S Dunn, Betsy M Rice, Jerry C LaSalvia, Army Research Laboratory, USA

(ICACC-S4-P058-2013) Synthesis of nanocrystalline AlMgB14 powders by solid state synthesis technique
Zhilin Xie*, Nina Orlovskaya, University of Central Florida, USA

(ICACC-S4-P059-2013) Improvements in the Spark Plasma Sintering of Magnesium Aluminum Spinel
Gordon A Alanko*, Darryl Butt, Boise State University, USA

(ICACC-S4-P060-2013) Consolidation of Aluminum Magnesium Boride (AlMgB14) by Pulsed Electric Current Sintering (PECS) Technique
Gary A. Gilde, Kyu Cho, Nesredin Kedir*, Army Research Lab, USA

(ICACC-S4-P061-2013) Mechanochemical synthesis of hexagonal OsB2
Zhilin Xie*, Nina Orlovskaya, University of Central Florida, USA; David Cullen, Oak Ridge National Laboratory, USA; Richard Blair, University of Central Florida, USA

(ICACC-S4-P062-2013) Al/Al2O3 metal matrix composites for armor applications
Prashant Karandikar*, M Cubed Technologies, Inc., USA; Eric Klier, Army Research Laboratories, USA;

Matthew Watkins, Michael Aghajanian, M Cubed Technologies, Inc., USA

(ICACC-S4-P063-2013) Microstructure and Mechanical Behavior of Pressureless Sintered and Reaction-Bonded Silicon Carbide Ceramics
Alison Trachet*, Ghatu Subhash, University of Florida, USA; Prashant Karandikar, M Cubed Technologies, USA

(ICACC-S4-P064-2013) Geometrical Effect on Damage in Reaction Bonded Ceramic Composites having Experienced High Strain Rate Impact
Andrew Marshall*, M Cubed Technologies, Inc., USA; Kevin J Doherty, Eric M Klier, U.S. Army Research Laboratory, USA; Prashant G Karandikar, Brian P Givens, Anthony F Liszkiewicz, Raul Segura, M Cubed Technologies, Inc., USA

(ICACC-S4-P065-2013) Surface preparation of silicon carbide for improved adhesive bond strength in armour
Andrew Harris*, Paul Smith, Julie Yeomans, University of Surrey, United Kingdom; Steve Burnage, Bryan Vaughan, Lockheed Martin UK, United Kingdom

(ICACC-S4-P066-2013) Production of silicon carbide-boron carbide composites for armour applications
Tom Williams*, Julie Yeomans, Paul Smith, University of Surrey, United Kingdom; Andrew Heaton,Dstl, United Kingdom; Chris Spacie, Roger Bayliss, Morgan AM&T, United Kingdom

(ICACC-S4-P067-2013) Static and dynamic response of ultra-high strength sintered ceramics
John J Pittari*, Ghatu Subhash, University of Florida, USA

(ICACC-S4-P068-2013) Tensile Strength, Fracture Toughness, and Flaw Characterization of Tungsten Carbide
Jared Wright*, UIC TS, Bowhead Science and Technology, LLC, USA; Jeffrey J Swab, U.S. Army Research Laboratory, USA
(ICACC-S4-P069-2013) The Effect of a Glass Coating on the Strength of Soda-Lime-Silicate Glass
Shelby Thies, Steve Kilczewski*, Jeffrey J Swab, Parimal Patel, Army Research Laboratory, USA

(ICACC-S4-P070-2013) Deformation Twinning in Transparent Single Crystals: Indentation Experiments and Mesoscale Modeling
Corydon Hilton*, Jian Yu, Oak Ridge Institute for Science and Education, USA; John Clayton, Jarek Knap, Jeffrey Swab, US Army Research Laboratory, USA

(ICACC-S4-P071-2013) X-ray Computed Tomography (XCT) of Confined Ceramics
Brian Leavy*, Army Research Laboratory, USA; Chris Peitsch, Chesapeake Defense Services, Inc., USA; William J Bruchey, Survive Engineering Company, USA

(ICACC-S4-P072-2013) Resonant Ultrasound Spectroscopy for the Evaluation of Armor Ceramics
Eric Warner*, Matthew Bratcher, U.S. Army Research Laboratory, USA

(ICACC-S4-P073-2013) Optimizing the Arrangement of Ceramic Tile Periodic Arrays for Armor Applications Using a Genetic Algorithm
Michael C Golt*, Matthew Bratcher, U.S. Army Research Laboratory, USA

(ICACC-S4-P074-2013) Numerical study of stress and fracture propagation in glass during ring-on-ring testing
Costas G Fountzoulas*, Jeffrey J Swab, Parimal J Patel, U.S. Army Research Laboratory, USA

(ICACC-S4-P075-2013) Operational Equations of State with Arbitrary Heat Capacity
Michael Greenfield*, ARL, USA

(ICACC-S4-P076-2013) Manufacturing Process Scale-Up of Transparent Spinel Ceramic at ArmorLine Corporation
John Voyles*, Joseph (J.J.) Nick, Joseph Spilman, Lawrence Shaffer, ArmorLine Corporation, USA

(ICACC-S4-P077-2013) Limits of accelerating numerical analysis study of the failure mechanism of ceramics during low velocity impact used in protective systems
Costas G Fountzoulas*, Raymond E Brennan, U.S. Army Research Laboratory, USA