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Composites at Lake Louise 2019

Proceedings

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11-10-2019

### Conference Program

John Kieffer

Meisha Shofner

Erik Spoerke

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## *Program*

# Composites at Lake Louise 2019

November 10-14, 2019  
Fairmont Chateau Lake Louise  
Alberta, Canada

### Conference Chairs

**John Kieffer**  
University of Michigan, USA

**Meisha Shofner**  
Georgia Institute of Technology, USA

**Erik Spoerke**  
Sandia National Laboratories, USA



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**Recent previous conferences in this series**

*The series was founded by Patrick Nicholson.*

***Composites at Lake Louise (CALL 2013)***

***November 3-7, 2013***

***Fairmont Chateau Lake Louise***

***Lake Louise, Alberta, Canada***

*Conference Chairs:*

Van Thompson, Kings College London

Jennifer Lewis, Harvard University

***Composites at Lake Louise (CALL 2015)***

***November 8-12, 2015***

***Fairmont Chateau Lake Louise***

***Lake Louise, Alberta, Canada***

*Conference Chair:*

Jim Smay, Oklahoma State University, USA

***Composites at Lake Louise (CALL 2017)***

***November 12-16, 2017***

***Fairmont Chateau Lake Louise***

***Lake Louise, Alberta, Canada***

*Conference Chair:*

Eric Duoss, Lawrence Livermore National Laboratory, USA

Waltraud M. Kriven, University of Illinois at Urbana-Champaign, USA

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## **Sunday, November 10, 2019**

16:30 – 18:30	Conference Check-in (Alpine Gallery)
18:45 – 19:00	Conference Welcome Conference Chairs and ECI Technical Liaison
19:00 – 20:45	<b><u>Nicholson Memorial Session</u></b> Session Chair: Meisha L. Shofner, Georgia Institute of Technology, USA
19:00 – 19:30	<b>Enabling circular engineering by redesigning a driver's side front door using ultralightweight thermoplastics composites via systems level design and simulation strategy</b> Srikanth Pilla, Clemson University, USA
19:30 – 20:00	<b>Geologic entropy with economic constraints predicts mineral prices</b> Alan J. Hurd, Los Alamos National Laboratory, USA
20:00 – 20:45	<b>Geopolymers: Versatile ceramics made at ambient temperatures</b> Waltraud M. Kriven, University of Illinois at Urbana-Champaign, USA
20:45	Reception (Heritage Hall)

### **Room locations and notes**

- General Sessions will be held in Mount Temple B. Parallel sessions will be held in Mount Temple A and B.
- Poster Sessions will be in Heritage Hall.
- Breakfasts will be in Lago Restaurant and lunches will be in Mount Temple C. The conference banquet location will be in Mount Temple A.
- The ECI office is the Parker Room.
- Audio, still photo and video recording by any device (e.g., cameras, cell phones, laptops, PDAs, watches) is strictly prohibited during the technical sessions, unless the author and ECI have granted prior permission.
- Speakers – Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before).
- Speakers – Please leave discussion time as previously directed by your session chair.
- 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.
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- Emergency Contact Information: Because of privacy concerns, ECI does not collect or maintain emergency contact information for conference participants. If you would like to have this information available in case of emergency, please use the reverse side of your name badge.

**Monday, November 11, 2019**

- 07:00 – 08:00 Breakfast
- 08:00 – 10:00 **Composites for Energy Storage and Conversion I (Parallel Session)**  
Session Chair: Erik Spoerke, Sandia National Laboratories, USA
- 08:00 – 08:30 **Composite polymer electrolytes for all-solid-state lithium batteries with nanostructured garnet ceramic fillers**  
Candace K. Chan, Arizona State University, USA
- 08:30 – 09:00 **Hybrid organic-inorganic nano-composites for solid-state battery electrolytes**  
John Kieffer, University of Michigan, USA
- 09:00 – 09:30 **Understanding the evolution of the silicon electrode SEI through model lithium silicate thin film layers**  
Christopher A. Apblett, Sandia National Laboratories, USA
- 09:30 – 10:00 **Dense ceramic cathodes for lithium and sodium batteries**  
Paul Braun, University of Illinois at Urbana-Champaign, USA
- 08:00 – 10:00 **Sustainable Synthesis, Processing, and Materials Design I (Parallel Session)**  
Session Chair: Brett G. Compton, University of Tennessee, USA
- 08:00 – 08:30 **Self-healing copolymers via van der Waals interactions**  
Marek Urban, Clemson University, USA
- 08:30 – 09:00 **Vapor phase infiltration for transforming polymers into organic-inorganic hybrid materials: Processing science, structural complexity, and emerging applications**  
Mark D. Losego, Georgia Institute of Technology, USA
- 09:00 – 09:30 **New furan-based thermosetting polymer systems**  
Giuseppe R. Palmese, Drexel University, USA
- 09:30 – 10:00 **A new paradigm in functionally graded adhesives**  
Daniel Schmidt, UML Plastics Engineering, USA
- 10:00 – 10:30 Coffee Break
- 10:30 – 12:30 **Composites for Energy Storage and Conversion II (Parallel Session)**  
Session Chair: Paul Braun, University of Illinois at Urbana-Champaign, USA
- 10:30 – 11:00 **Novel calcium ion conducting solid electrolyte with NASICON-type structure**  
Nobuhito Imanaka, Osaka University, Japan
- 11:00 – 11:30 **The ion seeps tonight: Assessing ionic transport in multilayered nanocomposites**  
Erik Spoerke, Sandia National Laboratories, USA
- 11:30 – 12:00 **Electrochemical artificial muscle yarns and textiles that harvest and store environmentally available energies**  
Ray Baughman, The University of Texas at Dallas, USA



**Monday, November 11, 2019 (continued)**

- 12:00 – 12:30      **Multi-component colloidal nanorod heterostructures and their optoelectronic/photovoltaic applications**  
Moonsub Shim, University Of Illinois, USA
- 10:30 – 12:30      **Sustainable Synthesis, Processing, and Materials Design II (Parallel Session)**  
Session Chair: Mark D. Losego, Georgia Institute of Technology, USA
- 10:30 – 11:00      **Direct-write additive manufacturing of polymer and ceramic composites**  
Brett Compton, University of Tennessee, USA
- 11:00 – 11:30      **Hyperbaric laser chemical vapor deposition of high-strength aluminum-silicon-carbide nanocomposite fibers for aerospace and transportation applications**  
James L. Maxwell, La Trobe University, Australia
- 11:30 – 12:00      **Cold sintered ceramic composites for microwave applications**  
Ian Reaney, University of Sheffield, United Kingdom
- 12:00 – 12:30      **Design of ceramic-polymer optical composites for building energy efficiency: Infrared property control and transparent bulk thermal insulators**  
Paul Clem, Sandia National Laboratories, USA
- 12:30 – 13:30      Lunch
- 13:30 – 14:15      **Poster Session I**
- 14:15 – 19:00      Ad hoc discussions / Networking / Free time
- 19:00 – 21:00      **Mechanics of Complex Systems I**  
Session Chair: Erik Spoerke, Sandia National Laboratories, USA
- 19:00 – 19:30      **Engineered Molding Compound (EMC): Optimizing the design, performance, and economics of carbon fiber composites for industrial applications**  
Jason Reese, Dow Chemical, USA
- 19:30 – 20:00      **Bioinspired design of structural and thermal interface materials**  
Nima Rahbar, Massachusetts Institute of Technology, USA
- 20:00 – 20:30      **Soft matter structure measurement by polarized resonant soft X-ray scattering**  
Dean DeLongchamp, NIST, USA
- 20:30 – 21:00      **Profiles in local glass transition temperature near and across polymer interfaces in nanostructured blends**  
Connie B. Roth, Emory University, USA

**Tuesday, November 12, 2019**

- 07:00 – 08:00 Breakfast
- 08:00 – 10:00 **Materials Design for Biomedical Applications I (Parallel Session)**  
Session Chair: John A. Nychka, University of Alberta, Canada
- 08:00 – 08:30 **Hierarchical hybrid materials for robust and reusable functional devices**  
Sharmila Mukhopadhyay, Wright State University, USA
- 08:30 – 09:00 **Organic-inorganic hybrid polymer coatings with controlled biofunctionality**  
Svetlana A. Sukhishvili, Texas A&M University, USA
- 09:00 – 09:30 **Protein-based drug delivery and thermal protection via Mof encapsulation**  
Jeremiah Gassensmith, University of Texas at Dallas, USA
- 09:30 – 10:00 **Additive manufacturing of monomer-free ORMOCER®-based composites for dental and audiological application**  
Herbert Wolter, Fraunhofer Institute for Silicate Research ISC, Germany
- 08:00 – 10:00 **Mechanics of Complex Systems II (Parallel Session)**  
Session Chair: Connie B. Roth, Emory University, USA
- 08:00 – 08:30 **High rate deformation behavior and extraordinary energy absorption of carbon nanotube mats and glassy polymer thin films**  
Edwin Thomas, Rice University, USA
- 08:30 – 09:00 **Defect coupling: The last frontier in predicting the strength, life, and durability of fiber reinforced composite laminates**  
Kenneth Reifsnider, University Texas Arlington, USA
- 09:00 – 09:30 **Tricomponent composites with cellulose nanocrystals and chitin nanofibers - Exploring potential synergy through component interactions**  
Meisha Shofner, Georgia Institute of Technology, USA
- 09:30 – 10:00 **Precise 3D structuring of polymer nanocomposites using triaxial magnetic fields**  
Namiko Yamamoto, The Pennsylvania State University, USA
- 10:00 – 10:30 Coffee Break
- 10:30 – 12:00 **Materials Design for Biomedical Applications II (Parallel Session)**  
Session Chair: Svetlana A. Sukhishvili, Texas A&M University, USA
- 10:30 – 11:00 **Ceramic composite bone tissue scaffolds**  
John A. Nychka, University of Alberta, Canada
- 11:00 – 11:30 **Improved mechanical performance of a next-generation hybrid bone adhesive**  
Alina Kirillova, Duke University, USA
- 11:30 – 12:00 **Natural functionally-graded composites in hard-to-soft tissue (bone-tendon) junctions**  
Linn W. Hobbs, Massachusetts Institute of Technology, USA

**Tuesday, November 12, 2019 (continued)**

- 12:00 – 12:30      **How big should your nanoindentation be? The implications of indentation size in assessing the properties of complex structure**  
David F. Bahr, Purdue University, USA
- 10:30 – 12:30      **Mechanics of Complex Systems III (Parallel Session)**  
Session Chair: Namiko Yamamoto, The Pennsylvania State University, USA
- 10:30 – 11:00      **Directions of zero thermal expansion in anisotropic oxides**  
Scott J. McCormack, University of Illinois at Urbana Champaign, USA
- 11:00 – 11:30      **Activating extrinsic and intrinsic toughening mechanisms in polycrystalline ceramics and their composites via microstructural engineering**  
Jessica A. Krogstad, University of Illinois, Urbana Champaign, USA
- 11:30 – 12:00      **A new paradigm to evaluate the cleavage energy of brittle materials**  
Dov Sherman, Tel-Aviv University, Israel
- 12:00 – 12:30      **Strategies to strengthen ceramics for windows and domes**  
Ivar Reimanis, Colorado School of Mines, USA
- 12:30 – 13:30      Lunch
- 13:30 – 14:15      **Poster Session II**
- 14:15 – 20:15      Ad hoc discussions / Free Time / Networking
- 20:15 – 20:45      **Conference Banquet Talk**  
Session Chair: John Kieffer, University of Michigan, USA
- Cosmic composites: Rocks from space and their astonishing influence on earth and humanity**  
Gregory A. Brennecka, University of Münster, Germany

**Wednesday, November 13, 2019**

- 07:00 – 08:00 Breakfast
- 08:00 – 10:00 **Sustainable Synthesis, Processing, and Materials Design III (Parallel Session)**  
Session Chair: Waltraud M. Kriven, University of Illinois at Urbana-Champaign, USA
- 08:00 – 08:30 **Processing and structure of Bopp film with nanoparticle-based additives**  
Krishnamurthy Jayaraman, Michigan State University, USA
- 08:30 – 09:00 **Imparting machine intelligence into direct ink write manufacturing**  
J. Daniel Berrigan, Air Force Research Laboratory, USA
- 09:00 – 09:30 **Bioinspired nanocomposites: Ordered 2D materials within a 3D lattice**  
Iryna Polishchuk, Technion-Israel Institute of Technology, Israel
- 09:30 – 10:00 **Scaling up graphene PET nano-composites for industry applications**  
Jay C. Hanan, Oklahoma State University, USA
- 08:30 – 10:00 **Functional Materials I (Parallel Session)**  
Session Chair: Geoff L. Brenneka, Colorado School of Mines, USA
- 08:30 – 09:00 **3D printing functional composites & devices**  
Michael McAlpine, University of Minnesota, USA
- 09:00 – 09:30 **Additive manufacturing of inorganic-organic hybrid materials for transdermal biosensor applications**  
Roger Narayan, North Carolina State University, USA
- 08:00 – 10:00 **Bio-Nanopatterning: Inkjet printed nanopatterned aptamer-based sensors for improved optical detection of foodborne pathogens**  
Lia Stanciu, Purdue University, USA
- 10:00 – 10:30 Coffee Break
- 10:30 – 12:00 **Functional Materials II (Parallel Session)**  
Session Chair: Lia Stanciu, Purdue University, USA
- 10:30 – 11:00 **Perovskite nitrides: A new playground for functional materials**  
Geoff L. Brenneka, Colorado School of Mines, USA
- 11:00 – 11:30 **Ag nanowire-based nanocomposites for interconnects of flexible/wearable electronics**  
Byungil Hwang, Chung-Ang University, South Korea
- 11:30 – 12:00 **Self-strengthening polymer composites by vibration**  
Aaron Esser-Kahn, University of Chicago, USA

**Wednesday, November 13, 2019 (continued)**

- 10:30 – 12:30      **Sustainable Synthesis, Processing, and Materials Design IV (Parallel Session)**  
Session Chair: J. Daniel Berrigan, Air Force Research Laboratory, USA
- 10:30 – 11:00      **Development and optimization of hybridized glass/carbon Lft composites for cost and performance**  
Kristin Hardin, Nippon Electric Glass, USA
- 11:00 – 11:30      **Carbon oxidation over silver/perovskite-type oxide composite catalysts**  
Hidenori Yahiro, Ehime University, Japan
- 11:30 – 12:00      **Beyond nanosilica: Geopolymeric nanoaluminosilicates for functional nanocomposites**  
Dong-Kyun Seo, Arizona State University, USA
- 12:00 – 12:30      **In situ synchrotron studies of oxide ceramics to 3,000°C**  
Waltraud M. Kriven, University of Illinois at Urbana-Champaign, USA
- 12:30 – 13:30      Lunch
- 13:30 – 14:15      **Poster Session III**
- 14:15 – 19:00      Free Time / Networking
- 19:00 – 21:00      **Mechanics of Complex Systems IV**  
Session Chair: Meisha L. Shofner, Georgia Institute of Technology, USA
- 19:00 – 19:30      **Coherent nanoprecipitates within a biogenic single crystal: From spinodal decomposition to a prestressing strategy**  
Boaz Pokroy, Technion, Israel
- 19:30 – 20:00      **Role of nanoscale coherent precipitates on the thermo-mechanical response of martensitic materials**  
Alejandro Strachan, Purdue University, USA
- 20:00 – 20:30      **Design, printing, and characterization of aerospace morphing structures**  
Jeffery Baur, Air Force Research Laboratory, USA

**Thursday, November 14, 2019**

- 07:00 – 08:00            Breakfast
- 08:00 – 09:30            **Impromptu I: Things we definitely know do not work**  
Session Chairs: John Kieffer, University of Michigan, USA  
Meisha L. Shofner, Georgia Institute of Technology, USA  
Erik Spoerke, Sandia National Laboratories, USA
- 08:30 – 11:30            **Poster Session IV**
- 10:00 – 10:30            Coffee Break
- 10:30 – 12:00            **Impromptu II: Things we believe will work with the right collaborator(s)**  
Session Chairs: John Kieffer, University of Michigan, USA  
Meisha L. Shofner, Georgia Institute of Technology, USA  
Erik Spoerke, Sandia National Laboratories, USA
- 12:00 – 12:15            Closing Remarks and Future Directions
- 12:15                        Lunch and Departures

*Posters*

# Composites at Lake Louise 2019

November 10-14, 2019  
Fairmont Chateau Lake Louise  
Alberta, Canada



**Engineering Conferences International**

## **Poster Presentations**

1. **Self-healable copolymers via van der Waals interactions**  
Siyang Wang, Clemson University, USA
2. **Reconstitution of elastic properties – New insights into the functional behavior of polymer matrix composites**  
John Kieffer, University of Michigan, USA
3. **Fracture of 3D printed brittle open-cell structures under compression**  
Dov Sherman, Tel-Aviv University, Israel
4. **Reprintable self-healing polymer networks**  
Svetlana Sukhishvili, Texas A&M University, USA
5. **Walnut shell extract as sustainable, eco-friendly and cost-effective green corrosion inhibitor for fabrication of active protective nanocomposite coating based on mesoporous carbon hollow nanospheres**  
Seyyedarash Haddadi, University of British Columbia, Canada
6. **Deeper understanding of cobalt-doped SiC nanowires as excellent electromagnetic wave absorbers**  
Caiyun Liang, Harbin Institute of Technology, China
7. **A novel and cost-effective double-capsule nanocomposite coating based on carbon hollow spheres with self-healing performance for corrosion protection**  
Seyyedarash Haddadi, University of British Columbia, Canada
8. **Investigating the mechanical properties of nonfunctionalized mwcnt reinforced polymer (pmma) nanocomposites**  
Anand Joshi, G H Patel College of Engineering and Technology, India
9. **Sintering of hierarchically-structured boron carbide for toughening and multi-functionality**  
Namiko Yamamoto, The Pennsylvania State University, USA