

*Program*

# Composites at Lake Louise 2015

November 8-12, 2015

Fairmont Chateau Lake Louise  
Lake Louise, Alberta, Canada

Conference Chair

**Jim Smay**  
Oklahoma State University  
USA



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## **Sunday, November 8, 2015**

- 16:30 – 19:00            Conference Check-in (Lobby outside LeFroy Room, ECI Conference Office)
- 18:45 – 20:30            **Plenary Session** (Victoria Ballroom)  
Session Chair: James Smay
- 18:45 – 19:00            **Welcome and Conference Overview**  
James Smay, Conference Chair  
Linn Hobbs, ECI Technical Liaison
- 19:00 – 19:45            **Deterministic three-dimensional composite structures for energy storage**  
Paul Braun, University of Illinois at Urbana-Champaign, USA
- 19:45 – 20:30            **Nicholson Memorial Lecture**  
**Towards accelerated medical innovation**  
Jeff M Karp, Institution of Brigham and Women's Hospital, USA
- 20:45 – 22:00            **Reception** (Red Room, ante-room outside Victoria Ballroom)

## **NOTES**

- The **Plenary** and **Biocomposites** sessions will be held in **Victoria Ballroom**.
- **Functional Composites Session 1** will be held in the **Agnes Room**, except Thursday
- **Functional Composites Session 2** will be held in the **Sun Room**.
- The **Structural Composites** sessions will be held in the **Louise Room**, except Thursday
- The **Poster Session** will be held at the **rear** of the **Victoria Ballroom**.
- The **ECI office** will be the **Lefroy Room**.
- **Breakfasts** will be in the **Poppy Brasserie**.
- **Lunches** and the conference **Banquet** will be in the **Victoria Ballroom**.
- Audiotaping, videotaping and photography of presentations are prohibited.
- Speakers – Please leave at least 5 minutes for questions and discussion.
- **Please do not smoke at any conference functions.**
- Turn your cellular telephones to vibrate or off during technical sessions.
- After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.
- Please write your name in the front of this program booklet so it can be returned if misplaced.

**Monday, November 9, 2015**

- 07:00 – 08:30            Breakfast
- 08:30 – 09:15            **Plenary Session** (Victoria Ballroom)  
Session Chair: Jennifer Lewis
- Rare earths, rare-earth oxides, and the oxides' unique character: Application for environmental catalysts**  
Nobuhito Imanaka, Osaka University, Japan
- 09:30 – 12:30            **Biocomposites Session** (Victoria Ballroom)  
Session Chairs: Valeria Milam and Erik Spoerke
- 09:30 – 09:50            **Self-assembly directs enamel formation and regeneration**  
Malcolm Snead, University of Southern California, USA
- 09:50 – 10:10            **Polymer melts inside nanoscale cylindrical pores: Chain conformations, polymer diffusion and local dynamics**  
Karen Winey, University of Pennsylvania, USA
- 10:10 – 10:30            **Aptamer panning against gold**  
Valeria Milam, Georgia Institute of Technology, USA
- 10:30 – 10:50            **Engineering hydrogels for dynamic modulation of stem cell activity**  
Kristopher Kilian, University of Illinois at Urbana-Champaign, USA
- 10:50 – 11:10            **Printing living tissues**  
Jennifer A Lewis, Harvard SEAS, USA
- 11:10 – 11:30            **Engineered GAG-based coatings for mesenchymal stem cells**  
Johnna Temenoff, Georgia Tech/Emory University, USA
- 11:30 – 11:50            **Supramolecular peptide composite assemblies: Mimicking biological form and function in synthetic systems**  
Erik David Spoerke, Sandia National Laboratories, USA
- 11:50 – 12:10            **The development of bioresorbable Fe-Mn alloys for orthopedic implantation**  
Lia Stanciu, Purdue University, USA
- 12:10 – 12:30            **Additively manufactured bio-based composites**  
Jennifer Rodriguez, Lawrence Livermore National Lab, USA
- 09:30 – 12:30            **Structural Composites Session** (Louise Room)  
Session Chairs: Michael Kessler and Chris Hansen
- 09:30 – 09:50            **Additive manufacturing of metals at high rate yielding controlled microstructure**  
James McGuffin-Cawley, Case Western Reserve University, USA
- 09:50 – 10:10            **Reactive Ni-Al nanostructured composites through electrochemical dispersion deposition**  
Christopher A Apblett, Sandia National Laboratories, USA

**Monday, November 9, 2015 (continued)**

- 10:10 – 10:30      **Additive manufacturing of bulk refractory fiber within the Ta-Hf-C system for ultra high-temperature reinforced composite materials**  
James Maxwell, Dynetics Company, USA
- 10:30 – 10:50      **Nanoscale deformation of composite structures and heterophase interfaces**  
Shen J. Dillon, University of Illinois at Urbana-Champaign, USA
- 10:50 – 11:10      **Thermosetting polymers and composites from agricultural oils**  
Michael Kessler, Washington State University, USA
- 11:10 – 11:30      **Cure kinetics and interfacial phenomena in polymer matrix composites**  
John Kieffer, University of Michigan, USA
- 11:30 – 11:50      **High efficient material and process combination for future aircraft applications based on advanced sheet molding compound technologies**  
Marc Fette, Helmut Schmidt University, Germany
- 11:50 – 12:10      **Automated fiber placement of multifunctional fiber-reinforced composites**  
Chris Hansen, University of Massachusetts, Lowell, USA
- 12:10 – 12:30      **Icosahedral phase strengthened nanocomposites for structural components**  
Thomas Watson, Pratt & Whitney, USA
- 09:30 – 11:50      **Functional Composites Session 1** (Agnes Room)  
Session Chairs: Eric Duoss and Daniel Therriault
- 09:30 – 09:50      **Design of multifunctional composites and their use for the 3-D printing of microsystems**  
Daniel Therriault, Ecole Polytechnique De Montreal, Canada
- 09:50 – 10:10      **Carbon nanocomposites structure and properties: Insights from TEM tomography**  
James Liddle, National Institute of Standards and Technology (NIST), USA
- 10:10 – 10:30      **Well-ordered nanohybrids and nanoporous materials from block copolymer templates**  
Rong Ming Ho, National Tsing Hua University, Taiwan
- 10:30 – 10:50      **Nanostructured metal-ceramic composites by internal reduction**  
Ivar Reimanis, Colorado School of Mines, USA
- 10:50 – 11:10      **Additive manufacturing of cellular materials with tailored properties**  
Eric Duoss, Lawrence Livermore National Laboratory, USA
- 11:10 – 11:30      **Shape reconfigurable liquid metals**  
Michael Dickey, North Carolina State University, USA
- 11:30 – 11:50      **Transport of nanoparticles in polyelectrolyte solutions as a model of polymer nanocomposite processing**  
Jacinta C. Conrad, University of Houston, USA



**Monday, November 9, 2015 (continued)**

- 09:30 – 12:10      **Functional Composites Session 2** (Sun Room, beyond Victoria Ballroom)  
Session Chairs: Nobuhito Imanaka and Brett Compton
- 09:30 – 09:50      **Imaging the interphase in polymer composites**  
Chelsea Davis, National Institute of Standards and Technology, USA
- 09:50 – 10:10      **Stimulus-responsive and conductive composites for remote sensing applications**  
Anastasia Elias, University of Alberta, Canada
- 10:10 – 10:30      **Fabrication and characterization of locally resonant acoustic metamaterials made with resonators generated from core-shell drops**  
Carlos Martinez, Purdue University, USA
- 10:30 – 10:50      **Stability of oxides/environmental barrier coating candidate materials in high-temperature, high-velocity steam**  
Elizabeth Opila, University of Virginia, USA
- 10:50 – 11:10      **Click chemistry and its unique benefits in composite formulation**  
Christopher Bowman, University of Colorado Boulder, USA
- 11:10 – 11:30      **Single and double heterojunction nanorods for optoelectronics**  
Moonsub Shim, University of Illinois at Urbana-Champaign, USA
- 11:30 – 11:50      **Bicontinuous networks of metal and elastomer for shape morphing composites**  
Robert Shepherd, Cornell University, USA
- 11:50 – 12:10      **3D printing of composites with controlled architecture**  
Brett Compton, University of Tennessee, USA
- 12:30 – 13:30      Lunch
- 13:30 – 19:00      Free Time
- 19:00 – 21:30      **Evening Plenary Session** (Victoria Ballroom)  
Session Chairs: James Smay and Jennifer Lewis
- 19:00 – 19:45      **Dispersion of powders in complex systems**  
James Adair, The Pennsylvania State University, USA
- 19:45 – 20:30      **Magneto-ionic control of interfacial magnetism**  
Geoffrey Beach, Massachusetts Institute of Technology, USA
- 20:30 – 21:15      **Concept and development of solid state ionic capacitors**  
Takaaki Tsurumi, Tokyo Institute of Technology, Japan

**Tuesday, November 10, 2015**

- 07:00 – 08:30 Breakfast
- 08:30 – 09:15 **Plenary Session**  
Session Chair: Jamie Grunlan
- Use of capillary flow to create flexible and embedded electronics**  
Lorraine Francis, University of Minnesota, USA
- 09:30 – 12:10 **Biocomposites Session (Victoria Ballroom)**  
Session Chairs: Ray Baughman and Kaushik Chatterjee
- 09:30 – 09:50 **Structural optimization of fiber-reinforced composite dental bridges**  
Alex Fok, University of Minnesota, USA
- 09:50 – 10:10 **Scalable directed assembly of nanostructured soft materials**  
Chinedum Osuji, Yale University, USA
- 10:10 – 10:30 **Powerful artificial muscles for morphing composites and other applications**  
Ray Baughman, University of Texas at Dallas, USA
- 10:30 – 10:50 **PGX – Technology: A versatile technology for generating advanced biopolymer materials**  
Bernhard Seifried, Ceapro Inc., Canada
- 10:50 – 11:10 **Graphene/ Polymer composites for biomedical applications: Tissue scaffolds, prosthetic joints and gene delivery**  
Kaushik Chatterjee, Indian Institute of Science, India
- 11:10 – 11:30 **Layered biomimetic and kirigami nanocomposites**  
Nicholas Kotov, University of Michigan, Ann Arbor, USA
- 11:30 – 11:50 **Self-organized soft-hard interfaces: From surfaces to biologically integrated hybrid materials**  
Candan Tamerler-Behar, University Kansas, USA
- 11:50 – 12:10 **Electric eels: Bizarre natural phenomena or inspiration for novel nanocomposite energy storage**  
Erik David Spoerke, Sandia National Laboratories, USA
- 09:30 – 11:50 **Structural Composites Session** (Louise Room)  
Session Chairs: Kevin Ewsuk and Daniel Schmidt
- 09:30 – 09:50 **Composite metallic nanofoam structures**  
David Bahr, Purdue University, USA
- 09:50 – 10:10 **Characterization and modeling to design and develop tailored-property filled glass composites**  
Kevin Ewsuk, Sandia National Laboratories, USA
- 10:10 – 10:30 **Structural composites from high performance bioepoxies**  
Daniel Schmidt, University of Massachusetts, USA
- 10:30 – 10:50 **Role of molecular interactions on the mechanics of nanocomposites**  
Dinesh Katti, North Dakota State University, USA

**Tuesday, November 10, 2015 (continued)**

- 10:50 – 11:10      **Amorphous metal sandwich composites with unprecedented strength**  
Jay Hanan, Oklahoma State University, USA
- 11:10 – 11:30      **Nanoclay based composite scaffolds for development of novel humanoid environment**  
Kalpana Katti, North Dakota State University, USA
- 11:30 – 11:50      **The break evolution process in composite microcomposites**  
Gale Holmes, National Institute of Standards & Technology, USA
- 09:30 – 12:10      **Functional Composites Session 1** (Agnes Room)  
Session Chairs: Alan Hurd and Cheng Zhu
- 09:30 – 09:50      **Deposition dynamics for processing functional polymer nanocomposite membranes**  
John A Howarter, Purdue University, USA
- 09:50 – 10:10      **Dynamical mechanical behavior of graphene and CNT materials under hypersonic projectile penetration**  
Edwin L Thomas, Rice University, USA
- 10:10 – 10:30      **Three-dimensional printing of graphene-based composite aerogels**  
Cheng Zhu, Lawrence Livermore National Lab, USA
- 10:30 – 10:50      **Chemically modified graphene-based composite paper electrodes for long-cycle metal-ion batteries**  
Gurpreet Singh, Kansas State University, USA
- 10:50 – 11:10      **Functional nanogels applied to materials development**  
Jeffrey Stansbury, University of Colorado, USA
- 11:10 – 11:30      **Composite materials for energy and sustainable development**  
Alan Hurd, Los Alamos National Laboratory, USA
- 11:30 – 11:50      **Constructing nanocrystal-in-glass composites for smart windows**  
Delia Milliron, University of Texas at Austin, USA
- 11:50 – 12:10      **Design and fabrication of microstructured composites using mechanical and magnetic stimuli**  
Rafael Libanori, ETH Zurich, Switzerland
- 09:30 – 12:10      **Functional Composites Session 2** (Sun Room, beyond Victoria Ballroom)  
Session Chairs: Ian Reaney and Serge Bourbigot
- 09:30 – 09:50      **Cellulose nanofibers networks for structural nanomaterials and biocomposites with multiple functions**  
Lars Berglund, KTH Royal Institute of Technology, Sweden

**Tuesday, November 10, 2015 (continued)**

- 09:50 – 10:10      **Composites on fire at reduced scale: evaluation, characterization and modeling**  
Serge Bourbigot, Lille University of Science and Technology, France
- 10:10 – 10:30      **Designer electrocatalysts from transition metal oxide heterostructure**  
Jin Suntivich, Cornell University, USA
- 10:30 – 10:50      **Low cost synthesis of silicon-based ceramic powders from Na, K and Cs Geopolymer**  
Waltraud (Trudy) Kriven, University of Illinois at Urbana-Champaign, USA
- 10:50 – 11:10      **Processing, properties and prospects for melt infiltrated (MI) SiCf-ceramic composites**  
Raj Narain Singh, Oklahoma State University, USA
- 11:10 – 11:30      **Laser-based three-dimensional printing of zirconium oxide hybrid materials**  
Roger Narayan, UNC/NCSU, USA
- 11:30 – 11:50      **Stimuli responsive nanocomposites based on cellulose nanocrystals**  
Johan Foster, Virginia Tech, USA
- 11:50 – 12:10      **Substitution and sustainability in functional materials and devices**  
Ian Reaney, University of Sheffield, United Kingdom
- 12:30 – 13:30      Lunch (Victoria Ballroom)
- 13:30 – 19:00      Free Time
- 19:00 – 21:15      Banquet (Victoria Ballroom)

**Wednesday, November 11, 2015**

- 07:00 – 08:30 Breakfast
- 08:30 – 09:15 **Plenary Session** (Victoria Ballroom)  
Session Chair: Trudy Kriven
- Exploration of the materials paradigm with respect to bioinspiration**  
John Nychka, University of Alberta, Canada
- 09:30 – 11:30 **Biocomposites Session** (Victoria Ballroom)  
Session Chairs: Tobias Niebel and Boaz Pokroy
- 09:30 – 09:50 **Novel anti-decay self-setting paste of hydroxyapatite/collagen nanocomposite utilizing GPTMS**  
Masanori Kikuchi, National Institute for Materials Science, Japan
- 09:50 – 10:10 **Direct printing of 2-component silicones in facial & body prostheses**  
James Smay\*, Oklahoma State University USA; Trevor Coward, King's College London, UK
- 10:10 – 10:30 **Magnetically assisted assembly of bioinspired composites**  
Tobias S Niebel, ETH Zurich, Switzerland
- 10:30 – 10:50 **Preparation of chitosan-siloxane porous hybrids with hydroxyapatite for repair of skull defect**  
Yuki Shirosaki, Kyushu Institute of Technology, Japan
- 10:50 – 11:10 **Ice formation in iron containing hydrogel films**  
Hyun-Joong Chung, University of Alberta, Canada
- 11:10 – 11:30 **Bio-inspired hybrid nanocomposites in single crystalline hosts: From structure to function**  
Boaz Pokroy, Technion - Israel Institute of Technology, Israel
- 09:30 – 11:50 **Structural Composites Session** (Louise Room)  
Session Chairs: Hongbing Lu and Hilmar Koemer
- 09:30 – 09:50 **Probing micro- and nano-scale elastic modulus variation in organic-rich shale—A naturally occurring composite**  
Corinne Packard, CSM, USA
- 09:50 – 10:10 **Increasing dispersion, performance, and pot-life in cellulose nanocrystal/waterborne epoxy composites**  
Meisha Shofner, Georgia Institute of Technology, USA
- 10:10 – 10:30 **Experimentally characterizing the behavior of fiber reinforced composite laminates under multi-axial loading: A historical review and current state of the art**  
John Wolodko, Alberta Innovates - Technology Futures, Canada
- 10:30 – 10:50 **Simultaneously strong and tough continuous nanofibers for next generation structural supernanocomposites**  
Yuris Dzenis, University of Nebraska-Lincoln, USA

**Wednesday, November 11, 2015 (continued)**

- 10:50 – 11:10      **Ductile organic aerogels for multifunctional applications**  
Hongbing Lu, The University of Texas at Dallas, USA
- 11:10 – 11:30      **Biologically inspired and impact-resistant composites**  
David Kisailus and Christopher Salinas, University of California, USA
- 11:30 – 11:50      **Physical aging and glass transition of single component nanocomposites**  
Hilmar Koerner, Air Force Research Lab, USA
- 09:30 – 12:10      **Functional Composites Session** (Agnes Room)  
Session Chairs: Geoffrey Brennecka and Avner Rothschild
- 09:30 – 09:50      **Multilayer nanocoatings capable of separating gases, killing bacteria and stopping fire**  
Jaime C Grunlan, Texas A&M University, USA
- 09:50 – 10:10      **Designing fire safe composites**  
Maude Jimenez, Lille University of Science and Technology, France
- 10:10 – 10:30      **Printed and structurally integrated electronics for air force applications**  
John D. Berrigan, Air Force Research Lab, USA
- 10:30 – 10:50      **Chemical heterogeneity in electroceramics: The good, the bad, and the difficult to characterize**  
Geoff Brennecka, Colorado School of Mines, USA
- 10:50 – 11:10      **Enhancing grain boundary ionic conductivity in mixed ionic electronic conductors**  
Kyle Brinkman, Clemson University, USA
- 11:10 – 11:30      **Mechanisms and models for SiC fiber strength changes after oxidation in air and steam**  
Randall Hay, Air Force Research Laboratory, USA
- 11:30 – 11:50      **Iron oxide thin film photoelectrodes for water splitting**  
Avner Rothschild, Technion - Israel Institute of Technology, Israel
- 11:50 – 12:10      **Using polymer brushes to tune the structure-plasmonic relationship in polymer nanocomposites containing nanorods**  
Russell Composto, University of Pennsylvania, USA
- 12:10 – 12:30      **Oxygen and carbon dioxide separation membranes based on mixed conductors**  
Hitoshi Takamura, Tohoku University, Japan
- 12:10 – 13:30      Lunch
- 13:30 – 19:00      Free Time

**Wednesday, November 11, 2015 (continued)**

19:00 – 20:00

**Evening Plenary Session**

Session Chairs: James Smay and Jennifer Lewis

19:00 – 19:15

**Conference Awards**

Linn Hobbs, Massachusetts Institute of Technology, USA  
ECI Technical Liaison

19:15 – 20:00

**Evening Speaker**

**Electronic and optical hybrid materials via self-assembly and nanoimprint lithography**

James Watkins, University of Massachusetts Amherst, USA

20.00 – 21:00

**Poster Session** (rear of Victoria Room)

**Thursday, November 12, 2015**

07:00 – 08:30 Breakfast

08:30 – 09:15

**Plenary Session**

Session Chairs: Raj Singh and James Smay

**Role of interfaces in polymer matrix composites and methodologies to improve and characterize interfaces in composites**

Ranji Vaidyanathan, Oklahoma State University, USA

09:30 – 10:10

**Structural and Functional Composites Session** (Victoria Ballroom)

Session Chairs: Kirk Ziegler and Akihide Kuwabara

09:30 – 09:50

**Augmented finite element method for virtual testing of high temperature CMCs**

Qingda Yang, University of Miami, USA

09:50 – 10:10

**Controlling the interfacial properties of one-dimensional nanostructures**

Kirk Ziegler, University of Florida, USA

10:10 – 10:30

**Thermally conductive composites**

Oren Regev, Gen-Gurion University of the Negev, Israel

10:30 – 10:50

**Atomistic structures and transport phenomena at interfaces in lithium battery materials**

Akihide Kuwabara, Japan Fine Ceramics Center, Japan

10:50 – 11:10

**Radiation resistance of vanadium-graphene nanolayered composites**

Seung Min Han, Korea Advanced Institute of Science and Technology, Korea

11:30 – 13:30

Lunch and departures



## Poster Presentations

- 1. Nature's tough composites: A look into biological fibrous architectures**  
Christopher Salinas/David Kisailus, University of California, USA
- 2. Hard/Soft composited materials for stretchable electronics**  
Hyun-Joong Chung, University of Alberta, Canada
- 3. Biopolymer composites from high-cellulose pulps and/or nanocellulose**  
Fabiola Vilaseca, KTH Royal Institute of Technology, Sweden
- 4. Center for bioplastics and biocomposites: Bringing INDUSTRY and UNIVERSITIES together to develop new biobased products and technologies**  
Michael R. Kessler, Washington State University, USA
- 5. Characterizing the functionality of transmembrane ion channels using planar bilayer membranes device and stopped flow spectrometer**  
Andrew Jo, University of Alberta, Canada
- 6. Manufacturing and testing of lightweight, liner-less all-composite tanks for storage and transportation of CNG**  
Ranji Vaidyanathan, Oklahoma State University, USA
- 7. Mica platelet-reinforced, geopolymer composites**  
Patrick Keane, University of Illinois at Urbana-Champaign, USA
- 8. Mechanical behavior and properties of REPO<sub>4</sub> studied by nanoindentation**  
Corinne E. Packard, Colorado School of Mines, USA
- 9. In situ study of phase transformations and phase equilibria in the tantala and hafnia binary system**  
Waltraud M. Kriven, University of Illinois at Urbana-Champaign, USA
- 10. Thermal expansion and phase transformation behavior in the rare-earth titanate system**  
Waltraud M. Kriven, University of Illinois at Urbana-Champaign, USA