



Gordon Research Conferences
frontiers of science

Solid State Studies in Ceramics Challenges Around Transport and Reactivity in Ceramics

July 20-25, 2014 **Mount Holyoke College** South Hadley, Mass.

Chair: **Monika Backhaus-Ricoult** Vice Chair: **Michael J. Hoffmann**

Connect with fellow scientists to discuss the frontiers of this scientific field!
Submit your **application** and abstract by June 22, 2014.

For more information, please visit

<http://www.grc.org/programs.aspx?year=2014&program=ceramics>

The Gordon Research conference on Solid State Studies in Ceramics has been held for over 50 years, initially exploring sintering and deformation, evolving to a wider range of ceramic materials and applications, and now embracing challenges of ceramic materials, their fundamentals, performance and applications, especially relative to energy conversion and storage, high temperature and structural applications, electroceramics etc. The ceramic materials considered can be bulk, thin film or nano-sized.

The 2014 conference will feature transport- and reactivity-related challenges in ceramic materials and keystone components. Phenomena related to ionic and charge carrier transport under driving forces (electric, temperature, strain fields) coupled with complex boundary conditions at interfaces and surfaces in multicomponent and often reactive systems will constitute the core topic of the conference. Related challenges at system level will be emphasized, including applications, for instance membranes, fuel cells, membrane reactors, batteries, supercapacitors, thermoelectric generators, electroresistive or memresistive switches, or electronic storage devices. Presentations and discussions will include novel materials, modeling, in-situ and/or nanoscale probing of transport and electrochemical properties and device performance/durability.

The conference provides an opportunity for investigators at all stages of their careers to meet a diverse and international group at the forefront of the field, take part in stimulating discussions on the latest breakthroughs and brainstorm remaining challenges. An extended poster session will serve as additional support for exchange. All participants are asked to bring posters, as an effective way to promote interaction and foster interdisciplinary collaborations. A small number of abstracts will be selected for short oral session presentations throughout the meeting.

SUNDAY

Keynote Session: Defects, Transport, Reactivity in Constrained Ceramics and Electrochemical Devices

Discussion Leader: **Carol Handwerker** (Purdue University)

Joachim Maier (Max Planck Institute for Solid State Research in Stuttgart)
"Defect Chemistry of Small Systems"

Sossina Haile (California Institute of Technology)
"Intermediate Temperature Fuel Cells: Opportunities, Challenges and Outlook"

MONDAY

Structure, Defects and Transport at Grain Boundaries, Interfaces and Surfaces

Discussion Leader: **Greg Rohrer** (Carnegie Mellon University)

Patrick Cantwell (Lehigh University)
"Grain Boundary Complexion Transitions and Their Influence on Structure, Properties and Processing of Materials"

Dominique Chatain (CNRS-CINaM-Marseille, France)
"Interface Faceting and Morphology and Wetting"

Roger de Souza (University Aachen, Germany)
"Understanding Diffusion in Complex Oxides and at Their Extended Defects"

Poster Session

Ceramics Under Large and/or Coupled Driving Forces

Discussion Leader: **William Chueh** (Stanford University)

Igor Lubomirsky (Weizmann Institute, Israel)
"Inelastic and Chemomechanical Effects in Ceramics with Large Concentrations of Point Defects"

Jason D. Nicholas (Michigan State University)
"Using Mechano-Chemical Coupling to Probe Oxygen Surface Exchange Coefficients"

Xiao-Dong Zhou
"Effect of Cyclic Potential on Phase Transformations in Ruddlesden-Popper Phases and Their Electrochemical Properties"

Tuesday

Charge Transfer Processes in Oxides and on Oxide Surfaces

Discussion Leader: TBA

Jennifer Rupp (ETH Zuerich, Switzerland)
"Materials for Ceramic Memristive Memory Applications"

Bruce S. Dunn (University California Los Angeles)
"Intercalation Pseudocapacitance: A Route Towards Oxide Supercapacitors?"

Yury Gogotsi (Drexel University)
"MXenes for Charge Storage Applications"

Poster Session

Carrier and Phonon Transport in Thermoelectric Materials

Discussion Leader: **Dmitri Kossakovski** (Gentherm Incorporated)

Gang Chen (Massachusetts Institute of Technology)

"Probing and Simulation Phonon and Electron Transport for Thermoelectric Applications"

Anke Weidenkaff (EMPA)

"Perovskite-Type Oxides and Oxynitrides for Thermoelectric Converters"

Poster Session

Wednesday

Assessment of Exchange Processes by *In-Situ* Studies and Modeling

Discussion Leader: **Mogens Mogensen** (Risoe National Laboratory, Denmark)

Venkat Viswanathan (Carnegie Mellon University)

"*Ab Initio* Modeling of Electrocatalytic Activity and Charge Transport of Oxide Materials for Electrochemical Applications"

Bilge Yildiz (Massachusetts Institute of Technology)

"Oxygen Reduction Mechanism on Perovskite Surfaces"

Sergei Kalinin (Oak Ridge National Laboratory)

"Mapping Oxygen Vacancy Dynamics and Reactivity in Solids at the Nanometer and Atomic Scales"

Poster Session

H-Conduction in Ceramics and Energy-Related Devices

Discussion Leader: **Sangtae Kim** (University of California, Davis)

"Discussion Leader's Introduction in the Field"

John Irvine (St. Andrews University, GB)

"Hydride Conduction in Oxides and Related Devices"

Saiful Islam (Bath University, GB)

"Modeling H-Conduction"

Poster Session

Thursday

Exchange Processes and Transport in Li- and Na-Batteries

Discussion Leader: **Linda Nazair** (Waterloo University, Canada)

Edwin Garcia (Purdue University)

"Phase Field Modeling and Electrochemical Systems: Applications to Rechargeable Li-Ion Battery Materials"

Nancy Dudney (Oak Ridge National Laboratory)

"Challenges of Li-Metal Batteries"

Juergen Janek (Giessen University, Germany)

"Solid Electrolytes in Alkali Batteries – Prospects and Pitfalls"

Ryoji Kanno (Tokyo Institute of Technology, Japan)

"Lithium Superionic Conductors and Their Application to All Solid-State Batteries"

Multidisciplinarity to Hit the Frontiers

Discussion Leader: **Monika Backhaus** (Corning Incorporated)

Hot Topics: Short Highlights from Posters

Keynote Speaker: **Arthur Heuer** (Case Western University)

"The Semiconductor Physics of Sapphire: Defect Chemistry and the Fermi Level"

Chair's Conference Closure

Conference special dinner

