



Symposium NM3: Aerogels and Aerogel-Inspired Materials

Aerogels are a diverse class of functional nanostructured, porous materials that simultaneously display extreme values of a number of materials properties typically found in disparate materials. Consequently aerogels and aerogel-inspired materials serve as versatile and tailorable 3D architectures for enabling technologies where the combination of nanosizing, high surface area, and inclusion of multiple functionalities is advantageous. In that regard, aerogels bridge the gap from micro to macro via meso and thus comprise a most versatile vehicle for transitioning the benefits of nanotechnology to everyday life. Aerogels of various types have been shown to exhibit unmatched performance in thermal superinsulation, energy storage, catalysis, acoustic damping, energetic materials, and drug delivery. Whereas aerogel technology was limited to only a few compositions in the 1990's and early 2000's, in the last ten years compositions of aerogels and aerogel-inspired materials have undergone an accelerated expansion to numerous organic polymers, organic-inorganic hybrids, quantum dots, nanocarbons, metal chalcogenides, and metals, resulting in unprecedented mechanical, catalytic, photonic, and chemical properties. Functionality-driven design has resulted in impressive volumetric supercapacitors and batteries, high strength-to-weight ratio materials, and drug delivery technologies, thus magnifying the potential of nanotechnology and porous architectures for many disciplines. Commercialization of aerogels and aerogel-like materials is also undergoing rapid development with several new players having entered the field, from small startups to global corporations.

The last major meeting of the aerogel community was at the Fall 2010 Meeting of the MRS and many new groups and numerous important technological developments have emerged since then. This symposium will survey the latest developments in the field and explore new uses, synthetic techniques, and applications of aerogels and aerogel-inspired materials that will benefit many subfields of materials science, including structural materials, catalysis, energy storage, electronics, and biomedical engineering. In addition to sessions on fundamental developments in aerogel science, this symposium will have a commercialization session with speakers from established and emerging aerogel companies. A panel with experts from organizations that have transferred technology to commercialization will be included.

Topics will include:

- Novel synthesis and processing methods
- Theory, fundamentals, and modelling
- Polymeric, inorganic, and composite aerogels
- Synthesis of large-scale parts and additive manufacturing
- Assemblies of 0D, 1D, and 2D nanostructures
- Metal, carbide, nitride, and other reduced compositions
- Electronic, magnetic, photonic, and plasmonic properties
- Mechanical, thermal, ballistic, and acoustic properties
- Batteries, supercapacitors, and hybrid electrochemical storage devices
- Biological materials, drug delivery, and tissue scaffolds
- Catalysis
- Commercialization, applications, and sustainability

A tutorial complementing this symposium is tentatively planned. Further information will be included in the MRS Program that will be available online in January.

Invited speakers include:

Indika Arachchige	Virginia Commonwealth University, USA	Rainer Ostermann	BASF, Germany
Nadja Bigall	University of Hannover, Germany	Jieshan Qiu	Dalian University of Technology, China
Hai Duong	National University of Singapore, Singapore	Anna Roig	Institut de Ciencia de Materials, Spain
Marc Hodes	Tufts University, USA	Debra Rolison	U.S. Naval Research Laboratory, USA
Kazuyoshi Kanamori	Tohoku University, Japan	Firouzeh Sabri	University of Memphis, USA
Matthias Koebel	EMPA, Switzerland	Thomas Schmidt	Paul Scherrer Institut and ETH Zurich, Switzerland
Hongbing Lu	University of Texas at Dallas, USA	Stephanie Vivot	NASA Glenn Research Center, USA
Barbara Milow	DLR, Germany	Marcus Worsley	Lawrence Livermore National Laboratory, USA

Symposium Organizers

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