

GREEN Open Seminar

14:00-15:00, Thursday, August 28 2014, Namiki Area 並木地区 NanoGREEN 4F 会議室
(Room #415) More details: contact Rudder WU (4702)

Sol-gel materials for future building applications: chemical synthesis strategies and application concepts

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Sustainable building and construction guidelines demand a drastic reduction of conductive heat losses and the replacement of fossil fuels by renewables. To avoid spacious insulating layers, superinsulating silica aerogel materials are a promising alternative. Similar non-silica, functional hierarchical porous materials can find use in energy conversion and storage applications.

We will begin with an overview of silica aerogels from alkoxide (TEOS, TMOS) and waterglass (sodium silicate) precursors and then move to reinforcement strategies: Aerogel Based Composites (ABCs) are generally accessible by compounding a sol-gel network structure with modification agents (fibers, nanoparticles or organic compounds). Recent advances in mechanical reinforcement by use of biopolymer modification will be discussed in the context of performance as well as their potential use in insulation products.

The second topic deals with non-silica aerogel materials for energy storage and conversion: Adsorption chillers utilize low-grade heat (solarthermal) to drive a thermal cycle and provide “green” cooling. We have developed new preparative routes to hydrophilic carbon xerogels with tailorable pore structure. These sorbents offer excellent properties for thermally driven heat pump applications. Similar carbon materials can also be used in electrochemical energy storage and conversion.

Last but not least, we will present a facile route to complex metal oxide aerogels and xerogels. Ni/YSZ and Ni/GDC aerogels / thin films are being developed for a new type of anode supported “thin film” SOFC design. On route to systematic studies of commonly used material combinations, conceptual ideas and first results on Ni/YSZ and Ni/GDC model systems are presented.