476g Fabrication of Tio2-Sio2 Aerogel Monolith with Ordered Mesostructures

Nan Yao and King Lun Yeung

Aerogels prepared by sol-gel and supercritical drying processes possess many unique physical and chemical properties, including large specific surface area and ultralow density with up to 95 % void volume consisting of open and disordered pores of broad size distribution. They also exhibit excellent thermal stability, superior insulating properties and good mechanical strength. Except for silica aerogel, it is difficult to prepare large blocks of freestanding aerogel materials.

This work reports a novel synthesis route to create a large blocks of freestanding TiO2-SiO2 aerogels with ordered hierarchical pore structures. The synthesis combined templating method with sol-gel process to create an ordered hexagonal mesoporosity within the alcogel materials. The three dimensional, nanoarchitecture was preserved during subsequent supercritical drying to create ordered mesostructured aerogel blocks. The selection of template molecule, synthesis composition and conditions as well as drying process dictate the pore size of the aerogel (4 to 10 nm). Nanostructured Anatase TiO2 crystals were crystallized in the aerogel matrix and were shown to be active for photocatalytic oxidation of volatile organic molecules.