

SYNTHESIS OF METAL-OXIDE AEROGELS FROM THEIR SALTS

Helmut Schäfer, Kathleen Heinrich, Barbara Milow, Lorenz Ratke

Institute of Materials Physics in Space, German Aerospace Center, 51170 Cologne, Germany

ABSTRACT

This paper describes the synthesis of metaloxide aerogels via the metal-salt epoxy route. Metals salts from silicon, titanium, iron, boron, tin, antimony, chromium, nickel, cobalt and copper were used. Wet gels were prepared by either directly inject them into water or they were added to waterglass. For instance silicontetrachloride can be transformed to a siliconoxide aerogel by direct reaction in water. The strong exothermic reaction is difficult to control and therefore process variations have to beemployed.

It is shown that the hydrolysis reaction and gel formation can be controlled by suitable epoxies and dilution with alcohols. Mixed aerogels of tin oxide and sodiumsilicates can be produced using tintetrachloride in waterglass followed by subsequent hydrolysis. Irontrichloride can be used in the same way by combination with water free sodium-waterglass and adjustment of the pH value using sodium hydroxide. A nice aerogel can be achieved after supercritical drying. The resultant aerogels are described in all cases using BET, BJH analysis, x-ray diffraction, density measurement, SEM and where appropriate TGA-FTIR.