EFFECT OF PYROLYSIS TEMPERATURE ON SURFACE AREA AND PORE VOLUME OF CARBON-SILICA COMPOSITE AEROGELS

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Abstract

This work proposes a facile synthesis of highly porous carbon-silica composite aerogels via a two-step process. Mixing of tetraethyl orthosilicate (TEOS) and kapok fibres in methanol is followed by gel incubation, solvent exchange and gel drying at atmospheric pressure. The dried fibre-silica composite aerogels are then pyrolysed under static N_2 atmosphere at temperatures in the range of 400-800 0C for 15 minutes. Remarkably, carbon-silica composite aerogels can be obtained by pyrolysing dried fibre-silica composite aerogels in the temperature range of 400 0C to 600 0C. In addition, pyrolysis temperatures above 600 0C can remove kapok fibres and yield only pure silica aerogel. Surface chemistry and pore morphology of porous carbon-silica composite aerogel were investigated in order to determine the effect of pyrolysis temperature on their surface properties. These results indicate that pyrolysed kapok fibres increased the surface area of conventional silica aerogel. However, both surface area and pore volume of carbon-silica composite aerogels are decreased with increasing pyrolysis temperatures from 400 0C to 600 0C. All adsorption isotherms obtained from N_2 adsorption on carbon-silica composite aerogels at 195 K are type IV isotherms. Mean pore size of these carbon-silica composite aerogels are in the range of 4 to 5 nm.

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