Morphology control of nickel nanoparticles prepared *in-situ* within silica aerogels produced by novel ambient pressure drying

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Silica aerogels are low density solids with high surface area and high porosity which are ideal supports for catalyst materials. The main challenge in aerogel production is the drying process, which must remove liquid from the pores of the wet gel while maintaining the solid network. In this work, the synthesis of silica aerogels and nickel-doped silica aerogels by a low energy budget process is demonstrated. Silica aerogels are produced by ambient drying using ammonium bicarbonate, rather than a conventional low surface tension solvent. Heating dissociates the ammonium bicarbonate, so generating CO_2 and NH_3 within the pores of the wet gel which prevents pore collapse during drying. Nickel-doped aerogels were produced by reducing nickel ions within pre-synthesised silica aerogels. The morphology of the resulting nickel particles – spheres, wires and chains – could be controlled through an appropriate choice of synthesis conditions. Materials were characterized using nitrogen adsorption/desorption isotherms, scanning electron microscopy, Fourier-transform infrared spectroscopy, thermogravimetric analysis and X-ray diffraction. The surface area of undoped aerogel is found to increase with the concentration of ammonium bicarbonate salts from 362 to 533 $m^2 g^{-1}$, and that of nickel-doped silica aerogel from 236 to 313 $m^2 g^{-1}$.