Abstract

In this report, the use of zeolite 13X as a template to generate ultrahigh surface area carbons, via a two-step process combining liquid impregnation and chemical vapour deposition is explored. The first step in the nanocasting process involves impregnation of zeolite 13X with furfuryl alcohol and the second step consists of chemical vapour deposition (CVD) of ethylene at 700 °C. Zeolite-like structural ordering was achieved for zeolite templated carbons (ZTCs) prepared at variable heating ramp rates of 5, 10 or 15 °C/min. The textural properties of ZTCs prepared at all heating ramp rates were comparable with small variations in which the lowest ramp rate (5 °C/min) generated ZTC with highest surface area and pore volume of 3332 m^2/g and 1.66 cm^3/g respectively. The carbon materials achieved a remarkable hydrogen uptake of 7.3 wt% at 20 bar and 77 K which is the highest ever recorded for carbon materials. This report also explores the mechanical stability of the ZTCs via compaction at up to 10*t* (equivalent to 740 MPa) in which the compacted samples showed minimal modification and retained high hydrogen storage capacity.