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Carbon Aerogel Spheres from Resorcinol/Phenol and Formaldehyde for CO_2 Adsorption

Authors : Jessica Carolina Hernandez Galeano, Juan Carlos Moreno Pirajan, Liliana Giraldo

Abstract : Carbon gels are materials whose structure and porous texture can be designed and controlled on a nanoscale. Among their characteristics it is found their low density, large surface area and high degree of porosity. These materials are produced by a sol-gel polymerization of organic monomers using basic or acid catalysts, followed by drying and controlled carbonization. In this work, the synthesis and characterization of carbon aerogels from resorcinol, phenol and formaldehyde in ethanol is described. The aim of this study is obtaining different carbonaceous materials in the form of spheres using the Stöber method to perform a further evaluation of CO_2 adsorption of each material. In general, the synthesis consisted of a sol-gel polymerization process that generates a cluster (cross-linked organic monomers) from the precursors in the presence of NH_3 as a catalyst. This cluster was subjected to specific conditions of gelling and curing (30°C for 24 hours and 100°C for 24 hours, respectively) and CO_2 supercritical drying. Finally, the dry material was subjected to a process of carbonization or pyrolysis, in N_2 atmosphere at 350°C (1° C / min) for 2 h and 600°C (1°C / min) for 4 hours, to obtain porous solids that retain the structure initially desired. For this work, both the concentrations of the precursors and the proportion of ammonia in the medium where modify to describe the effect of the use of phenol and the amount of catalyst in the resulting material. Carbon aerogels were characterized by Scanning Electron Microscope (SEM), N_2 isotherms, infrared spectroscopy (IR) and X-ray Powder Diffraction (XRD) showing the obtention of carbon spheres in the nanometric scale with BET areas around 500 m2g-1.

Keywords : carbon aerogels, carbon spheres, CO_2 adsorption, Stöber method
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