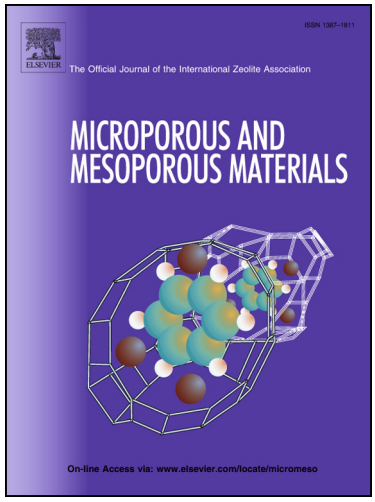

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Development of mesoporosity in carbon spheres obtained by Stöber method

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Abstract

A slightly modified Stöber method was used to fabricate monodispersed carbon spheres. Resorcinol and formaldehyde were employed as carbon precursors and ammonia as a catalyst. Mesoporosity was developed by addition of various amounts of colloidal silica. After silica dissolution, mesopores were created in the structure of microporous carbon spheres. Hydrofluoric acid in comparison to sodium hydroxide solution was more effective as an etching agent. Finally, micro-mesoporous carbon spheres with diameters in the range of 120-500 nm were obtained. Physicochemical properties of the carbons studied were obtained by scanning electron microscopy (SEM), thermogravimetric analysis (TG) and low-temperature nitrogen adsorption. The sample prepared using 3:2 silica to carbon ratio by weight exhibited the best adsorption parameters; namely, specific surface area of 682 m^2/g, total pore volume of 0.65 cm^3/g, total mesopore volume of 0.42 cm^3/g, micropore volume of 0.23 cm^3/g, and mesopore diameter of 11.4 nm. The resulting carbon spheres, due to their micro-mesoporous nature, are attractive materials for various gas-phase and liquid-phase applications such as adsorption of organic pollutants.

Key words: carbon spheres, microporous carbons, mesoporosity development, nitrogen adsorption, phenolic resins

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