

Nanocomposites and nanomaterials

Surfactant-free sol-gel synthesis of organic-inorganic silicas with oligosaccharide “host” cavities for binding aromatic “guests”

I.M. Trofymchuk, L.A. Belyakova

Chuiko Institute of Surface Chemistry of NAS of Ukraine, 17 General Naumov Str., 03164 Kyiv, Ukraine.

E-mail: trofymchuk_iryina@ukr.net

A wide range of alkoxy silanes are used for the synthesis of organic-inorganic hybrid silicas in the presence or the absence of structure forming templates. At the same time, (3-chloropropyl)triethoxysilane (CPTES) remains one of the most promising for silica functionalization. Immobilized chloropropyl fragments on silica surface could be useful in the sorption processes, catalysis, or as anchoring groups for further modification [1,2].

The present study demonstrates a simple time-saving method of organic-inorganic (with chloropropyl and/or β -cyclodextrin (β -CD) groups) silicas obtaining via sol-gel synthesis in mild condition without using toxic solvents, costly templates or cyclodextrin derivatives. Silica hybrids were prepared by the acidic hydrolysis (0.1M HCl) of β -CD and tetraethylorthosilicate (TEOS) or TEOS/CPTES blend in ethanol. The effect of various synthesis parameters, including relative reagent concentration (TEOS/CPTES ratio), temperature, and the hydrothermal treatment, on the structure and composition of silicas was investigated. All materials were characterized by IR spectroscopy, chemical and thermogravimetric analysis, low-temperature adsorption-desorption of nitrogen. Sorption experiments were carried out to study the influence of β -CD “host” carries in silica matrix on aromatic compounds uptakes from gas and aqueous phases. Gas phase adsorption isotherms of benzene at 298 K were received. In order to estimate the uptake of aromatics from aqueous solutions, kinetic studies and sorption isotherms of phenol at 292 K were performed. The probably effectiveness of organic-inorganic silicas for sorption of aromatic molecules was discussed.

1. *Tertykh V.A., Belyakova L.A.* Chemical reactions involving silica surface //Naukova Dumka, Kiev. – 1991.
2. *El-Nahhal I.M., El-Ashgar N.M.* A review on polysiloxane-ligand systems: Synthesis, characterization and applications // J Organomet Chem.-2007.-**692**. -P. 2861-2886.