

Nanocomposites and nanomaterials

Sol-gel synthesis of ordered β -cyclodextrin-containing silica

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The development of the new synthesis routes of organic-inorganic silicas provides numerous opportunities for creation materials with unique characteristics. Among a large number of organic compounds for silica functionalization, cyclodextrin (CD) macromolecules are very promising because of their ability to form inclusion complexes with chemicals of suitable geometry and functionality [1]. It was exploited two principal methods of CD-functionalized silica materials producing – attachment to the support by covalent bond formation or sol-gel synthesis using CD-silane.

In this work, to incorporate β -CD in silica matrix the co-condensation method was employed. First, CD-containing organosilane was prepared by modification of (3-aminopropyl)triethoxysilane (APTES) with β -CD using N,N'-carbonyldiimidazole as linking agent:

Then, obtained product was co-condensed with tetraethyl orthosilicate in the presence of cetyltrimethylammonium bromide to yield CD-MCM-41 silica. The template was removed by extraction in ethanol-acid solution.

IR spectroscopy and quantitative chemical analysis (0.016 mmol CD/g) were performed to confirm the presence of functional groups in the silica matrix. N₂ sorptometry experiments exhibited the expected high surface area (800 m²/g) and bimodal pore size distribution (3.92 and 5.08 nm diameter pores, NLDFT equilibrium model) of obtained material. Hexagonally arranged porous structure of

synthesized CD-MCM-41 silica was verified by transmission electron microscopy.

1. *Martin Del Valle E. M.* Cyclodextrins and their uses: a review // *Process Biochem.*-2004.-**41**.-P. 1033-1046.