

## Creation of novel organic-inorganic hybrid materials for water treatment from heavy metal ions

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### Abstract

Using the template method there were synthesized mesoporous silica materials with significant parameters of the porous structure and high adsorption capacity. So far, however, their selectivity towards metal ions, acid residues and substances with low molecular weight is still under question. Typically, the functional layer is introduced in the matrix of the sorbent during the synthesis using suitable alkoxy silanes. Depending on the tasks, it is possible to influence the formation of the functional layer by varying the nature of functional groups, their ratio and number. The materials with bi- and trifunctional active layers are especially interesting because they represent a wide field for the design of the structure and selectivity of mesoporous sorbents and their further application. For example, combining the phosphonic and other acidic groups, there can be obtained selective materials for heavy and rare-earth metal sorption.

Thus, current research deals with the synthesis of bifunctional materials of SBA-15 type using sodium silicate and various ratios of N-[(3-trimethoxysilyl)propyl]ethylenediamine triacetic acid trisodium salt / diethylphosphatoethyltriethoxysilane by template method (template P123).

We studied the influence of the ratios of the reactants on the physicochemical properties of these materials. The synthesized materials were analysed using XRD, IR spectroscopy, adsorption and thermal analysis, TEM and SEM.

The sorption selectivity and effectiveness obtained samples were studied on the mixture of cations of rare-earth and heavy metals.

Consequently, applying our methodology there can be produced bifunctional materials with well-developed porous structure.

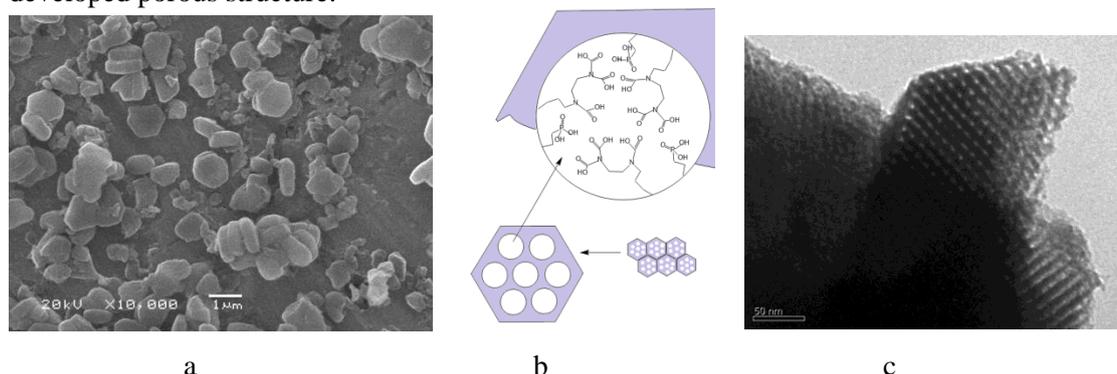


Fig. 1. PNC sample: a) SEM photo, b) scheme of structure, c) TEM photo

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**Keywords:** mesoporous silica, template method, SBA-15, hybrid adsorbent, heavy and rare-earth metal sorption