Synthesis of mesoporous materials for extraction of heavy and rare-earth metal ions

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Nowadays the topical issue is the search of sorbents for metal ions from aqueous solutions that would be regenerable, work at different pH values, possess high selectivity and sorption capacity. The maintaining of high sorption properties while using in many cycles and the maximum reduction of the sorbents price are also important. We decided to combine our experience in the synthesis of bifunctional xerogels by sol-gel method [1, 2] and monofunctional SBA-15 type materials [3, 4] in order to apply it to the template method of synthesis to produce bifunctional sorbents.

For this purpose, materials with spatially ordered structures (SBA-15-type) based on sodium metasilicate (SM) with bifunctional PO/SH layer were synthesized and approved as sorbents for heavy and rare earth elements. There were also obtained bifunctional materials of the same type (based on TEOS), and monofunctional silica with SH- and $P(O)(OH)_2$ groups (both from TEOS and SM) for comparison. We have also varied the acidity of media for mesophase processing and the type of its heat treatment (hydrothermal or microwave).

a b

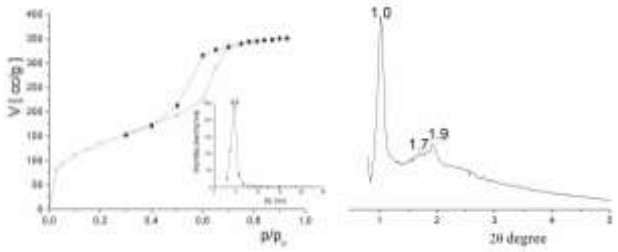

Fig. Isotherm of N_2 adsorption-desorption (at -196°C) with pore-size distribution (*a*) and XRD of bifunctional sample with phosphonic and tiol groups (*b*)

Considering specific surface (~ 500 m^2/g) and other physical and chemical characteristics of these materials (Fig.), they can be regarded as potential sorbents for some ions of heavy and rare earth elements.

1. O.A. Dudarko, Y.L. Zub *et al*., Zh. Prikl. Khim. **81** (2008) 118.
2. O.A. Dudarko, G.R.Yurchenko *et al*., Visnyk DonU. **2** (2009) 273.
3. O.A. Dudarko, C.Gunathilake *et al*., Colloids and Surfaces A, **482** (2015) 1.
4. O.A. Dudarko, C.Gunathilake *et al*., Colloids and Surfaces A **459** (2014) 4.