Nanocomposites and nanomaterials

Natural minerals coated with biocompatible polymer: synthesis, properties and application

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In order to improve the adsorption properties of mineral adsorbents it is expedient to immobilize the appropriate substances with well-pronounced ion-exchanging and complexing properties onto their surfaces. Application for this purpose natural biopolymers, such as a nitrogen-containing polysaccharide chitosan, is of a great interest. The aim of this work was to study the peculiarities of chitosan coating formation on the surface of natural minerals and to explore adsorption properties of the prepared composites.

Chitosan-clinoptilolite (*CS/Clin*) and chitosan-saponite (*CS/Sap*) composites have been obtained by impregnation of minerals with chitosan solution (the chitosan/mineral weight ratio was 1 : 10) followed by crosslinking of 5% amino groups of the polymeric layer with glutaraldehyde. Anchorage of chitosan on the minerals surface was confirmed by IR spectroscopy. Concentration of immobilized chitosan was estimated using data of thermogravimetric analysis and differential scanning calorimetry-mass spectrometry. Average surface area and pore size distribution were investigated by nitrogen adsorption/desorption isotherms. Morphology of the surface was study by scanning electron microscopy.

The synthesized composites were found to show an increase in adsorption capacity with respect to milligram amounts of toxic metal oxoanions and decreasing with respect to cations of heavy metals in comparison with initial clinoptilolite and saponite. In particular, adsorption capacity of *CS/Clin* and *CS/Sap* composites with respect to Cr(VI) is 0.54 and 0.59, respectively, to Mo(VI) – 0.7, and V(V) – 0.6 mmol/g, whereas the adsorption capacity of synthesized composites towards Zn(II), Cu(II), Cd(II), Pb(II), Fe(III) ranged from 0.01 to 0.26 mmol/g.

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