

Nanostructured surfaces

Synthesis and adsorption properties of 4-vinylpyridine and styrene copolymer *in situ* immobilized on silica surface

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One of the modern directions of new adsorbents synthesis is immobilization on the surface of inorganic oxide materials nitrogen-, sulfur- or oxygen-containing polymers with complexing and ion-exchange properties. Immobilization of multifunctional polymers on solid surfaces can be carried out by their adsorption or chemical binding. A promising way to create organic nanocomposites with valuable mineral adsorption properties is polymerization in the presence of inorganic particles (*in situ* immobilization).

Due to *in situ* immobilization of 4-vinylpyridine and styrene copolymer on the surface of silica a new organic nanocomposite material has been synthesized. The fact of heterophase polymerization has been confirmed by ¹H NMR and IR spectroscopy. The amount of copolymer immobilized on silica surface was estimated with TGA analysis and mass-spectrometry.

An adsorption activity of the synthesized composite towards micro quantity of Ni(II), Cu(II), Mn(II) and Fe(III) ions has been observed in a neutral aqueous medium. A high adsorption activity towards micro quantity of Pb(II) ions in an acidic medium (oxalate buffer) has been observed in contrast with negligible adsorption activity towards Co(II), Cd(II) and Zn(II) ions with no dependence from pH.

Calculations of adsorption capacity of the synthesized composite made on the basis of adsorption isotherms gave the next values: for Ni(II) ions in water nitrate-solutions 0,17 mmol/g (for parent silica gel 0,001 mmol/g), for Pb(II) ions 0,04 mmol/g (for parent silica gel 0,002 mmol/g), for Cu(II) ions 0,03 mmol/g (for parent silica gel 0,006 mmol/g) and for Fe(III) ions 0,027 mmol/g (for parent silica gel 0,008 mmol/g).