

# "Nanotechnology and nanomaterials"

## Cuprum (II) sorption by silica nanoparticles containing complexing 3-aminopropyl groups in their surface layers

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Amino groups are known to form stable complexes with Cu (II) ions. Electronic spectra and electron paramagnetic resonance spectra (EPR) of such complexes are well-studied and the dependence between composition and structure of these complexes using indicated physical methods are defined. This allowed using spectral variant of metal probe method to analyze the topography of the surface layer of noncrystalline polysiloxane and polysilsesquioxane carriers with 3-aminopropyl groups,  $\equiv\text{Si}(\text{CH}_2)_3\text{NH}_2$ . In current research,  $\text{Cu}^{2+}$  ions sorption by amino-containing spherical silica nanoparticles was investigated, and there was made an attempt to define the structure of complexes forming in the surface layers, using electron spectroscopy of diffuse reflectance (ESDR) and EPR spectroscopy. Nanosized silica spheres were used as amino-containing sorbents, derived from tetraethoxysilane (TEOS) (samples **1**, **2**, **3**) or 1,2-bis(triethoxysilyl)ethane (BTESE) (sample **4**) and 3-aminopropyltriethoxysilane (APTES).

There was analyzed the dependence of  $\text{Cu}^{2+}$  withdrawal (from solutions) from phases contact time. For samples **1-3** equilibrium is reached within about 16-24 hours, while for sample **4** - within 6 hours.  $\text{Cu}^{2+}$  sorption isotherms of for the synthesized samples were derived under static conditions. For every sample different M:Lig ratios are observed (evaluated from plateau in isotherms).

Using IR spectroscopy, it was shown, that the composition of polysiloxane networks of nanoparticles does not change after Cu (II) ions sorption. In addition, the shift of symmetric and asymmetric stretching vibrations bands of the amino group indicates the coordination of amino groups with of atoms of copper. The derived conclusion is consistent with diffuse reflectance spectroscopy and EPR data. Consequently, it is possible to regulate the surface layer topography of functionalized silica nanoparticles by changing nature and ratios of reacting components.

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