

DIFFERENT-LIGAND COMPLEXES OF SOME TRANSITION METALS ON THE SURFACE OF SILICA GELS, MODIFIED NITROGEN-CONTAINING LIGANDS

The purposeful synthesis of the heteroligand complexes (HLC) of transition metals like $SiO_2] - L_1M^{n+}L_2$ on chemically modified silica gel requires thorough investigation of conditions of their formation, predicted selection of complexing reagent for providing stability of HLC, the influence of functional groups on the composition and structure. In the present research the characteristics of HLC formation of Ni (II), Co (II) and Mo (VI) on silica gel with functional N-containing groups, and some organic reagent with functional N- and S-containing groups were studied. Silica gel with chemically bounded aminopropyl (S-NH₂) and ethylenediamine groups (S-en), and silica gel with impregnated polyhexamethyleneguanidine chloride (S-PHMG) were involved in complex formation. The stability of HLC of Ni (II) and Co (II) with unithiol on the surface of (S-NH₂) and (S-en), which is related to the difference of energy processes in the formation of bonds in such complexes, was substantiated based on published data. The stability of heteroligand complexes depends on the method of synthesis was studied. The required excess of the reagent towards metals ions for stable HLC formation was established. For example, the unithiol's excess towards Ni(II) ions is represented by the ratio Ni:Un=1:2, HLC on the surface is destroyed as unithiol's concentration increases. On the contrary, the color intensity of HLC of Co (II) increases as the molar reagent's excess do. In the study of sorption of Ni (II) and Co (II) ions (with treatment of adsorbates by unithiol's solution) and metal complexes with unithiol on sorbent C-PHMG was determined, that the surface acquires the same color in case of last one. In this case the bounding of complex with unithiol is due to electrostatic interaction between negative charged sulpho groups of organic reagent and protonated amino groups of PHMG, which are not involved in the formation of hydrogen bonds with hydroxy groups of the surface.

In all diffuse reflectance spectra there is direct proportion between the metal content in the sorbent phase and Kubelka-Munk function, which allows to determine the metal by solid phase photometry method. The formation of the colored heteroligand complexes of Ni (II) and Co (II) on chemically modified silica gel in dynamic conditions also was used for the development of visual test system for the determination of these metals, which was characterized by LOQ = 0,1 mg/L. The formation of blue colored complexes of Mo (VI) on silica gel with impregnated polyhexamethyleneguanidine chloride (S-PHMG) with Pyrocatechol Violet can be applied for solid phase photometry determination of this metal, which is characterized by LOQ = 1 µg/0,2 g of sorbent. 1 µg Mo(VI) /0,2 g of sorbent could be detected by colorimetric measurements with using scanner and computer software imaging.

Key words: different-ligand complexes, transition metals, diffuse reflection spectroscopy.