O-01

XPS spectra of uranium (VI) adsorbed on red clay

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XPS spectra of uranyl acetate $UO_2(CH_3COO)_2$ adsorbed on red clay were registered. The bands in the spectra: U 4f7/2 i U 4f5/2 were deconvoluted into two components, which were attributed to the adsorption of U(VI) ions on silanols ≡Si-OH and aluminols ≡Al.-OH. The spectra registered for the samples prepared in the presence of phosphates in the aqueous phase have different character showing only one component for the pH 5.2-5.3 and this probably results from the formation of surface complexes U(VI)-PO_4^{3-}-≡Si-OH lub U(VI)-PO_4^{3-}-≡Al-OH.. Both uranyl ions and phosphates can play the bridging role in these complexes [1].

It results from the equilibrium data for U(VI) sorption on red clay that the sorption percentage is enhanced when compared with the case of phosphates absence and from this one can conclude about potential application of red clay as geological barrier in the immobilization of uranium originating from nuclear wastes.

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L-02

Investigation of the electronic states of $FeTiO_3$ by X-ray photoemission, X-ray absorption and Auger electron spectroscopy

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Ilmenite ($FeTiO_3$) is a wide band gap p-type semiconductor with a band gap of about 2.5 eV [1]. Solid solution hematite (α-Fe_2O_3) and ilmenite ($FeTiO_3$) is one of the interesting material for spintronics applications [2,3]. The electronic structure of the $FeTiO_3$ is considered as the mixed valence Fe^{2+} and Fe^{3}+ assuming nominal state +4 of titanium. However, some experimental data suggested the presence of titanium with valency +3 due to the charge transfer from Fe^{2+} to Ti^{4+} [4].

In order to verification of the real electronic structure we performed the resonant photoemission study (RESPE) of the valence band combined with x-ray absorption study (XAS) for natural ilmenite material. The XAS spectra were obtained on the $L_{2,3}$ edge of titanium and iron. The valence band spectra were obtained for the photon energies corresponding to in- and off- resonance of iron and titanium. Our results show that iron existed in two different +2 and +3 oxidation states, and valence of titanium is +4. The ilmenite was also study by standard x-ray photoelectron spectroscopy (XPS) after Ar+ ion bombardment at higher temperature. The metallic behavior of the surface was detected. The small nanocrystals on the surface were observed and analyzed by electron microscope and auger electron spectroscopy (AES).

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