Contribution ID: **254** Type: **Poster**

Solubility and sorption behavior of monazite chemical components in humic acid solution

Thursday, 22 April 2010 12:00 (20 minutes)

By using the method of solubility it is shown that long (15 days) exposure of monazite powder in the aqueous solutions of natural or synthetic humic acids (HA) give rise to 10 to 100 times more high solubility of heavy p-, d- и f-elements of Periodic system of D.I. Mendeleev in comparing with humic-less solutions. The level and rate of the solubility is shown to depend on the initial concentration of HA in solution and pH (fig.1). The conclusion is made that the resistance of inorganic phosphates toward HA should be taken into consideration in the construction of phosphate matrixes for immobilization of poisonous and radioactive chemical elements.
Another aspect of monazite solubility in HA natural water solutions concerns transfer the solubility products, the humic complexes of p-, d- и f-elements through heterogeneous porous media with ion-exchange properties. This problem is extremely complicated and manifold [1,2]. As a first approximation the transfer (or sorption, S) of the microelements (ME) in the considering "gross-system", which assumed to include the water soluble and colloid HA, HA- and hydroxo-complexes of ME, the ion-exchanger, depends on the heterogeneous interaction in the sub-systems "ME-ion-exchanger", "ME-HA", "HA-ion-exchanger". In the frame of this concept [2] the presentation summarize experimental data on sorption behavior of La(III), Th(IV), U(VI), Sr(II) and other microelements, the soluble chemical components of monazite in HA water solutions, toward strong cation-exchanger in Na-form. Example of such a data shows (fig.2.), that sorption of a ME is strongly depends on the HA solubility as a function of pH. Another coexisting factor is the "ME - HA(colloid)"–"ME-ion-exchanger"competitive sorption at critical micelle concentration point (pH<4). Physicochemical aspects of the gross-system evolution in the field of such a parameters as pH, HA content, monazite solubility are discussed in the presentation.

Literature. [1]. Polyakov E.V., Khlebnikov N.A., Surikov V.T., Trapesnikov A.V., Udachin V.N., Remez V.P. Radioprotection. 2009. V. 44. № 5. P. 209-215; [2] Egorov Yu.V. The statics of the microelements sorption on the oxyhydroxides. Moscow, Atomisdat, 1975, 350 p. (in Russ.); [3]. E.V.Polyakov et al. Doklady Academii Nauk, 2009, V.428, № 5, P. 1–4 (in Russ.).

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Session Classification: Poster Session - Separation Methods, Speciation

Track Classification: Separation Methods, Speciation