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Study of states of uranylphosphates and uranylarsenates of monoacid, divalent and trivalent elements in water-salt heterogeneous systems

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The state of compounds of general formula $Ak(BvUO_6)_k \cdot nH_2O$ (Ak - alkaline, alkaline earth, 3d-transition and rare earth elements; Bv - P, As) in aqueous solutions in the wide range of pH 0-14 was investigated. The acid-base range of existence of uranylphosphates and uranylarsenates was established, products of conversion were identified and the solubilities of these compounds were determined. Using of the obtained data and the instrument of equilibrium thermodynamics, the solubilities of products, Gibbs's functions of formation of the compounds $Ak(BvUO_6)_k \cdot nH_2O$ and solubility curves were calculated, diagrams of the state of uranium (VI) and arsenic (V) in solution and equilibrium solid phases were constructed.

It was established that the behavior of all compounds $Ak(BvUO_6)_k \cdot nH_2O$ in aqueous solutions obeys to common foundations due to their structure and chemical properties similarity of phosphorus and arsenic. Acidity has the most significant influence on the state of studied compounds in the water-salt heterogeneous systems. Generally uranylphosphates are chemically more stable than uranylarsenates. That conclusion one can prove by wider acid-base ranges of their existence and the lower solubility. Derivatives of alkaline and alkaline earth elements in both families of compounds hold their composition and structure interacting with aqueous solutions in wide range pH 2-11, whereas uranylphosphates and uranylarsenates of lead, 3d-transition and rare earth elements save their individualities in more narrow range of pH 2-8.

It was shown that the solubilities of all uranylphosphates and uranylarsenates are minimal in the neutral solutions and increases after transition into acid and base media. In the general case solubilities of uranylphosphates and uranylarsenates at the same pH decreases with increasing of the interlayer atom radius.

Author: Dr NIPRUK, Oxana (Nizhni Novgorod state University)

Co-authors: Prof. CHERNORUKOV, Nikolay (Nizhni Novgorod state University); Dr PYKHOVA, Yulia (Nizhni Novgorod state University)

Presenter: Dr NIPRUK, Oxana (Nizhni Novgorod state University)

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