

Structure of new Different-ligand Uranyl Complexes

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Synthesis and structure investigation were performed for new uranyl complexes including three different acid ligands: sulfate or selenate ions, thiocyanate, and oxalate ions. As is known, thiocyanate ions are at the end of the row of mutual replacement in uranyl complexes, that means lower donor ability of thiocyanate nitrogen or sulfur atoms in comparison with oxygen atoms of prior oxygen-containing ligands, in particular, of oxalate, sulfate, and selenate ions. A special synthetic method allowed us to obtain the compounds of this group considering the essential differences in complexing abilities of the ligands. According to X-ray analysis data the crystal structure of $(\text{NH}_4)_4[(\text{UO}_2)_2(\text{C}_2\text{O}_4)(\text{XO}_4)_2(\text{NCS})_2] \cdot 6\text{H}_2\text{O}$ [$\text{X} = \text{S}$ (I) or Se (II)] is formed by ribbons $[(\text{UO}_2)_2(\text{C}_2\text{O}_4)(\text{XO}_4)_2(\text{NCS})_2]^{4\infty-}$ connected to 3D framework by ammonium ions and water molecules. In relation to uranium atoms oxalate groups are quadridentate-bridging, selenate ions are bidentate-bridging, and iso-thiocyanate ions are monodentate. The compounds I and II are related to the crystallochemical group $\text{A}_2\text{B}^2_2\text{K}^{02}\text{M}^1_2$ ($\text{A} = \text{UO}_2^{2+}$). The compounds are characterized by the methods of derivatography, IR and Raman spectroscopy. The results of the analysis of I and II vibrational spectra are in a good correlation with the data of the X-ray experiment.

Keywords: uranyl compounds, crystal structure research, x-ray analysis