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Behavior Ca, Sr, Ba tungstates in alkali chloride melts LiCl-KCl

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Promising technology of recycling spent nuclear fuel suggests dissolving it in melts chlorides of alkali elements, with extraction of valuable components (U, Pu, minor actinide, etc.) and the transferring of radioactive waste into insoluble compounds. Such technology is anhydrous, therefore, it is more advantageous environmentally compared to aqueous processes. Chloride melts are resistant to radiation and can be easily cleaned from impurities. At the same time relatively high working temperatures melts allow to concentrate and to transfer of radionuclides into stable chemical forms directly in the melt. In turn, the search of sustainable radioactive waste both in aqueous systems and in the melts chemical forms for consolidation is one of the main tasks of radiochemical science. Mineral-like compounds may be regarded as such forms. Among there are compounds with the structure of the mineral scheelite (CaWO4), which are studied as forms of binding such fission products as alkaline earth elements (Sr, Ba) in some alkali chloride melts.
In the present work, in order to develop technology concentration of strontium and barium, and their extraction from the molten LiCl-KCl, the purpose was to explore 1) the possibility of formation of strontium and barium tungstates (scheelite structure) due to the reactions in the melt, 2) stability of such phases in the melt and 3) kinetics of dissolving the formed precipitates at T = 450, 500, 600 ℃. Samples were obtained by us using the precipitating processes in aqueous systems and characterized by X-ray diffraction (XRD).
XRD data of precipitates, which were formed in melts , confirm the formation of strontium and barium tungstates (tetragonal crystal system, s. g. I41/a). It was established that the alkaline earth element transition into the solid phase is ~ 98 - 99% (at T = 600 ℃).
Tungstates of calcium, strontium and barium remain stable in contact with melt LiCl-KCl to T = 600 ℃ (test time to 10 hours).
Based on the kinetics data were calculated solubility values tungstates at T = 450, 500 and 600 ℃. It is established that an increase in temperature increases the solubility of 1.5 - 2 times.
Comparative analysis of solubility allows to do the prediction about the extraction of Sr and Ba in sorption processes (in addition to data on precipitation technology).

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