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# The process of high-temperature saturation of sorbents lived radio nuclides from solutions of highly active waste and converted into mineral like matrices

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The concept of radioactive waste management of IAEA and State Corporation "Rosatom" is based on the principle of multilevel environmental protection, according to which the isolation of the waste will be provided by the system of engineering and natural barriers including inert matrix, sealed container, buffer (filler) and geological formation.
The main objective of the first barrier is the containment of radionuclides in the solid phase, which prevents their transition into the environment.
The task was to develop a process of obtaining mineral like matrices (MLM) saturated by the highly active waste (HLW) imitators from nitric acid solutions. Ways to accomplish the task were: high-temperature saturation of the sorbents and their subsequent conversion to MLM.
Commercial sorbents "Termoxide-5", "Termoxide-3"and active alumina were used as starting materials after a two-stage heat treatment. It has been established that the maximum saturation is reached when using the sorbent "Termoxide-5".
For the conversion of saturated and calcined sorbents to mineral like matrix the method of induction melting in a cold crucible on a hot support was used. The MLM samples of 200 g each without adding of the alloying components, as well as with additives of iron or/and manganese oxides were obtained and analyzed. The following techniques: X-ray phase analysis, scanning electron microscopy and X-ray fluorescence analysis were used to study the resulting materials.
The estimated rate of the rare-earth elements leaching from samples of MLM does not exceed 10-7 g/cm2 per day.
It should be noted that the conversion of saturated sorbents in mineral like matrix by the method of induction melting in a cold crucible on a hot support has several advantages compared to pressing and sintering operations: higher productivity , the ability to organize the process in a continuous mode; less stringent requirements for the quality of the batch; reaching temperatures of 3000℃ or more, virtually eliminates restrictions on the choice of the MLM compositions; more stable composition and quality of the end product due to steady state that is provided by the required time of exposure in the molten state.

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