PHASE FORMATION STUDY OF A MATRIX RECEIVED BY THE SHS METHOD

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There is about 560 million cubic meters of radioactive waste accumulated within the territory of Russian Federation; moreover, 50 % of it is located in temporary storages before further reprocessing. Besides that, 5 million cubic meters of radioactive waste is originated every year. [1].

Matrix-based materials are expected to help overcome the above-mentioned drawbacks. One of the most prospective matrixes for radioactive waste immobilization is perovskite ceramics. It is an analogue of natural stable minerals, capable of meeting structural behavior requirements for radioactive waste immobilization.

Initial charge material was prepared on the assumption of the following exothermic reaction:

$$Nd_2O_3 + Al = Nd_2AlO_3$$

Sample 1 with Al/Nd_2O_3 proportion 1/1 and compaction pressure 25 MPa (Fig. 1) after SHS has the following phase composition: 69,1% Al, 19,6% Nd_2O_3, 11,3% $NdAlO_3$.

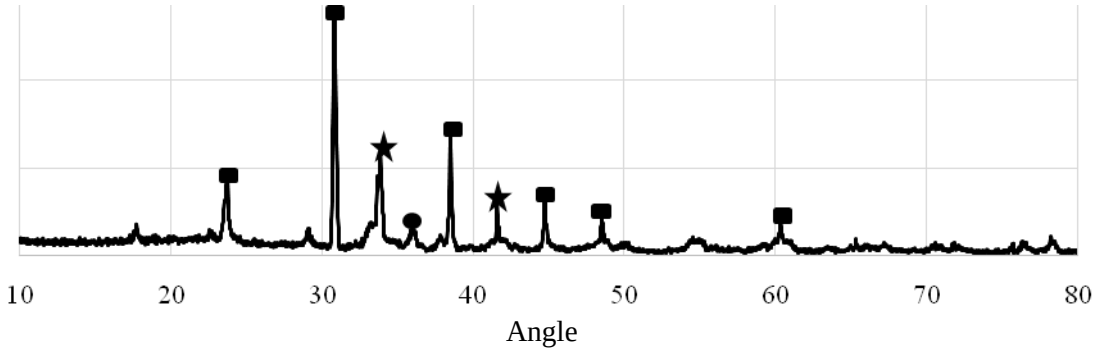

Fig. 1 – Sample 1 X-ray diagram,
where ■ – $NdAlO_3$ – 11,3 %, ● – Nd_2O_3 – 19,6%, ★ – Al – 69,1 %.

Analyzing the data obtained by XRD, it was established that the reaction temperature in the samples during the flow of SHS does not reach the required level for the formation of perovskite $NdAlO_3$, at the periphery of the samples. It is possible to achieve an increase in the reaction temperature by adding Ni to the initial charge and carrying out the synthesis in a vacuum.

References

1. Skachek M.A. Spent nuclear fuel and radioactive waste management of NPP. – Moscow: Publ. MEI, 2007, p. 488.