# ESTIMATION OF THE PARAMETERS OF SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS FOR OBTAINING A MATRIX MATERIAL BASED ON PEROVSKITE CERAMICS FOR IMMOBILIZATION OF ACTINIDE FRACTION

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One of the long-term and dangerous consequences of nuclear programs is the accumulation of radioactive wastes. Existing technologies of immobilization of radioactive wastes such as cementation and vitrification have a several disadvantages mainly is the high rate of desalination. It makes them unsuitable for long-term storage of radionuclides.

One of the promising technologies for the immobilization of actinide fraction of high-level wastes is the obtaining perovskite-based matrix elements from commercially available powders in SHS mode [1]. Such phase composition is advantageous over glasses due to higher corrosion and desalination resistances.

The synthesis is based on the perovskite matrix material with Ni additive to the initial blend components (Ni powder of brand «PNK–OT1», Al powder of brand «PA–4»). Radioactive wastes were imitated by $Nd_2O_3$ powder of brand «TU 609-4272-84».

The percentage of neodymium oxide additives varied from 5 to 80% by weight. The study of dilution limits of samples has shown that the maximum degree of dilution of the sample is about 70 wt.%, In excess of this value the propagation of combustion wave stops. This leads to SHS termination.

X-ray analysis of obtained materials was carried out in order to determine their phase composition. It revealed that the samples with the percentage of $Nd_2O_3$ of 20% or more have following phases formations: aluminum oxide, nickel aluminide and aluminum-based perovskite. By increasing the amount of $Nd_2O_3$ to 30% or more phase formation is shifted toward the formation of aluminum oxide, which leads to fragility increase of samples.

Experiments has shown that the stable regime of propagation of combustion wave occurs only when pressure of sample molding is about 30 $kgf/cm^2$ or more. However, when the pressure of sample molding of the initial system is above 50 $kgf/cm^2$ there is a significant increase in specific power output of reactions occurring in the sample unit volume, leading to a thermomechanical degradation of samples during the synthesis.

## References

1. Skachek M. Spent nuclear fuel and radioactive waste management of NPP. – MPEI. – 488 p.