

**THERMODYNAMIC ASPECTS OF CORROSION PROTECTION
OF METALLIC MATERIALS IN MOLTEN SALTS**

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Currently, water-based technologies are used for reprocessing spent nuclear fuel (SNF), which have such disadvantages as long-term exposure to spent nuclear fuel before reprocessing, and a significant amount of liquid waste. The high-temperature electrochemical technology of SNF processing is devoid of a number of disadvantages of currently existing technologies, molten salts practically do not undergo radiolysis, and therefore the SNF exposure before processing can be reduced to about one year.

The design of a molten salt reactor has a number of advantages over the most common water cooling option: operation takes place at a lower pressure in the core and a higher temperature; fluoride and chloride salts are promising coolants, as a result of which they allow to expand the operating temperature range of installations; fuel leakage, accidents do not form explosive gas mixtures when contact with water and humid atmosphere.

When developing a liquid salt reactor, one of the most pressing problems is the problem of choosing a structural material that is resistant to oxidizing agents present in the fuel salt. To select the most suitable of a number of candidate materials, it is advisable to perform a computational and theoretical study of the values of the isobaric-isothermal potential of the interaction reactions of the components of candidate materials (nickel, copper, molybdenum, chromium, iron, niobium) with a salt medium of fluoride melts based on lithium, sodium, and potassium fluorides (FLiNaK) containing actinide fluorides and their imitators (plutonium, neodymium, cerium, and uranium fluorides).

For all oxidation reactions of components of candidate structural materials with fluorides of salt components, isobaric-isothermal potentials take on positive values. This means that in all such reactions, the equilibrium is shifted towards the initial reagents, that is, towards the metal. However, there are some reactions whose isothermal potential is close (compared to others) to zero, which means that a significant part of the metal must pass into an oxidized form to maintain equilibrium. When the reaction products are removed from the system, the oxidation process of the structural material can continue. Among the considered candidate structural materials, the lowest value of the isobaric-isothermal potential corresponds to chromium oxidation reactions, and the highest value corresponds to nickel. Among the considered oxidizing agents, the lowest value of the isobaric isothermal potential corresponds to the reduction reactions of uranium (IV).