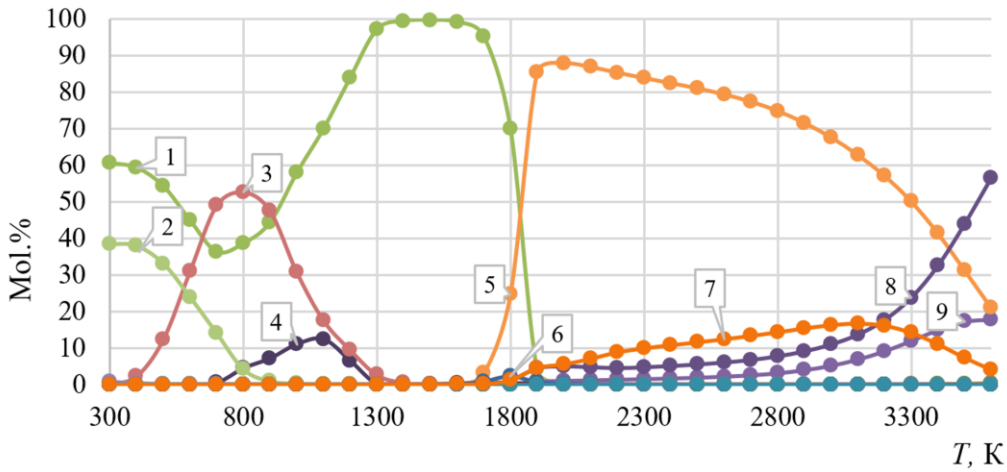
ANALYSIS OF THE DISTRIBUTION OF URANIUM RADIONUCLIDES IN THE CONDITIONS OF HEATING REACTOR GRAPHITE IN THE AIR ATMOSPHERE

Barbin N.M., Titov S.A.
Ural Institute of the State Fire Service EMERCOM of Russia
620062, Ekaterinburg, Mira st., 22

The largest amount of reactor graphite is found in RBMK power reactors, the mass of graphite masonry in one unit is about 1800 tons. The total amount of irradiated reactor graphite in Russia reaches 60 thousand tons. The available technologies for processing graphite nuclear waste are based on the principle of isolation from the environment, which in turn cannot provide a significant reduction in volume.

Currently, incineration is the most promising way to handle spent graphite materials. To study the temperature conditions of processing and physico-chemical processes occurring in the atmosphere (O_2 : N_2 = 1.0 : 3.3), it is necessary to conduct a thermodynamic analysis.

The calculation of thermodynamic modeling of the behavior of uranium radionuclide was carried out in the TERRA program. In the temperature range from 300 to 3600 degrees Kelvin (K) in increments of 100 K, at a pressure of 0.1 MPa. The paper presents the results of an analysis of the behavior of uranium radionuclides in the air atmosphere.



Distribution of uranium: 1 – $UO_{2(к.)}$; 2 – $UOCl_{2(к.)}$; 3 – $UOCl_{(к.)}$; 4 – UCl_4; 5 – UO_3; 6 – $CaUO_{4(к.)}$; 7 – UO_3^-; 8 – UO_2^+; 9 – UO_2

When the temperature rises from 400 to 2000 K, uranium compounds in the condensed phase are observed in the form of ($UO_{2(к.)}$, $UOCl_{2(к.)}$, $UOCl_{(к.)}$, $CaUO_{4(к.)}$). As the temperature increases from 1000 K to 3600 K, uranium compounds enter the ionized phase (UO_3^-, UO_2^+) and the gaseous phase (UO_2, UO_3, UCl_4).