



Results of thermal stability tests of the IGR reactor HEU fuel

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The use of highly enriched uranium-graphite fuel (HEU fuel) in research reactors is of great concern to the world community due to the danger of nuclear material proliferation suitable for nuclear weapons fabrication. In this regard, large-scale work is currently being carried out at the IAE NNC RK related to the conversion of two unique research reactors IVG.1M and IGR, which should be subjected to a procedure with a decrease in fuel enrichment from 90% to 19.75% U-235 (LEU fuel).

Individual solutions for the nuclear fuel design of batch reactors pose high requirements for the designers of a new low-enriched fuel.

Before the IGR reactor is converted to LEU fuel, it is required a series of tests, one of which is the high temperature stability of fuel under cyclic process of heating-cooling conditions.

This paper describes the experimental procedure and thermocyclic test results of a HEU fuel sample. The results of thermocyclic tests of a HEU fuel sample will be a reference when comparing with the results of thermocyclic tests of HEU fuel samples. Therefore, the main criteria for the suitability of using LEU fuel in the IGR reactor will be mass loss of the sample during thermal cycling, which should not exceed the values obtained during the test data with HEU fuel.

The tests have been carried out at the TiGrA experimental complex, created on the basis of the TGA/DSC 3+ thermogravimetric analyzer and ThermoStar mass spectrometric gas analysis system. As a result of testing the HEU fuel sample, 100 heating-cooling cycles were carried out in the temperature range from 150°C to 1100 °C with a heating rate of 100 °C/min and cooling rate of 50 °C/min. In this case, the change in the sample mass and the gas phase composition above the sample were recorded.

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