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Calculation Model and Static Parameters of the IBR-2M Reactor

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In this work the results of modeling and simulating the burnup of the IBR-2M pulsed fast reactor in the Monte Carlo software package. A three-dimensional geometric model of the reactor has been developed, including an active zone with 64 fuel assemblies, a PO-3 reactivity modulator, a control and protection system, and a liquid metal sodium coolant. Critical calculations and simulation of the fuel campaign up to an energy production of 2040 MW·d have been performed, taking into account two fuel refueling.
It was found that the effect of the first replacement of the simulator with a fresh fuel assembly at an energy production of 6 MW·d·kg-1 was ˜1.55%, and at the next replacement at 18 MW·d·kg-1 it was ˜1.43% keff. Analysis of the dynamics of the coefficients of non-uniformity of energy release showed an increase in the radial coefficient with a stable axial one, which is associated with the redistribution of the fuel mass after refueling. The critical parameters of the reactor obtained by the Monte Carlo method include keff = 1.0023, the initial reactivity margin of ˜2.5 βeff and the neutron generation lifetime of 58 ns.
The results confirm the adequacy of the Monte Carlo model for predicting the behavior of the IBR-2M reactor under fuel burnout conditions and demonstrate the impact of overloads on operational stability and power distribution.

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