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On the possibility of using various types of fuel in the MBIR reactor core

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MBIR is a 150 MWt multipurpose research sodium cooled fast reactor, designed for a broad range of experimental studies in various lines of research. Vibropacked MOX-fuel with relatively high plutonium weight content (under 40%) is accepted as the standard fuel for MBIR reactor facility. At the same time, there is a principal possibility of using alternative types of fuel in this reactor: both uranium fuel (based on enriched uranium dioxide) and highly dense uranium-plutonium fuel (mixed nitride and mixed metal), which are of interest for innovative fast reactors. Moreover, at the initial stage of MBIR operating, it is possible to use combined vibropacked oxide fuel (based on plutonium and enriched uranium), which is accepted as the standard for reactor BOR-60 (content of plutonium under 24%).

Types of fuel under consideration differ not only by density, but also by other characteristics that are important for neutron physics of the reactor. Particularly, they have different nuclear properties of fission materials (plutonium or uranium-235), different quantity of diluent (oxygen etc.) nuclei per heavy nucleus etc. All this factors define the neutron spectrum and critical parameters of the core.

One of the important requirements for this reactor is high maximum neutron flux density (not less than $5 \cdot 10^{15} \text{n/cm}^2 \text{sec}$). Special emphasis in this report is placed on the analysis of the dependence of neutron flux density and the rate of damaging dose accumulation from type of fuel, as well as the analysis of MBIR neutron flux distinctive features compared to energy reactors.

Country/Int. Organization

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