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X-RAY DIFFRACTION STRUCTURAL ANALYSIS OF STRUCTURAL AND FUEL MATERIALS FOR BN-600 REACTOR

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Operation of BN fast reactor structural and fuel materials under hard irradiation and at high temperatures leads to significant irreversible changes in material structure.
X-ray diffraction analysis is a common physical method for materials testing and condition monitoring. Different techniques help to determine crystal phase composition, form, internal stress, crystal preferred orientation (grain orientation) and other parameters.
At the Institute of Nuclear Materials (INM) a shielded cabinet of the D8 ADVANCE remote machine (BRUKER, Germany) is used for the examination of samples with activity up to 5.6⊠1011 Bq for 60Co.
A curved monochromator and a scintillation counter are mounted on the stationary arm covered with a lead protective shroud to reduce ionizing irradiation impact of the examined highly radioactive materials.
At INM there is a lot of information collected on the characteristics of fine structure of austenitic steels used for claddings, irradiated fuel compositions including uranium dioxide and MOX fuel.
Dependencies of the effect of the change (within specifications) in main alloying element concentration and low irradiation doses on the lattice parameter of ChS-68 steel solid solution were obtained. Determination of the contribution of the cladding initial state structural factors to the swelling is in process.
The study of possible determination of plutonium concentration in MOX fuel and division of plutonium, oxygen enhancement ratio and fission product contribution to the lattice parameter changes has been carried out.

Country/Int. Organization

Russian Federation /Joint Stock Company «Institute of Nuclear Materials»

Primary author: Mr TSYGVINTSEV, Vladimir (Joint Stock Company “Institute of Nuclear Materials”)

Co-author: Mrs GLUSHKOVA, Natalia (Joint Stock Company «Institute of Nuclear Materials»)

Presenter: Mr TSYGVINTSEV, Vladimir (Joint Stock Company “Institute of Nuclear Materials”)

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