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POSTREACTOR STATE OF THE STANDARD AND EXPERIMENTAL BN-600 FUEL KINDS

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A large number of post irradiation examinations of the state of spent fuel element composition have been carried out for more than ten years of successful operation of BN-600 core of the third 01M2 modification. The paper aims to substantiate operating capacity of standard and certain experimental oxide fuel kinds with service life characteristics increase, in particular, burn-up depth increase.
Examinations include analysis of gamma-emitting fission product distribution, swelling and fuel porosity measurements, metallography of kernel structural changes, kernel physicochemical and thermomechanical interaction with cladding material, X-ray diffraction analysis and oxygen enhancement ratio assessment.
It is shown that with burn-up range 8.9–12.4 % FIMA uranium dioxide pellets are compatible with ChS-68 and EK-164 cladding steels. It leads to structural changes and fuel creep under restricted swelling inducing high-temperature corrosion not exceeding 65 μm. There is a tendency to residual gap broadening with burn-up increase due to high-porous unstable rim of the pellets.
Fuel film generation on the cladding internal surface is typical for MOX fuel pellets with burn-up to 11.6 % FIMA. Kernel microstructure contains low-porous globular which interpreted as depleted uranium dioxide. Significant internal corrosion increase regarding standard fuel is not detected.
Vibropac uranium gettered MOX fuel with burn-up to 10.1 % FIMA shows no high-temperature interaction with ChS-68 steel cladding. However an abnormal thermomechanic deformation of the cladding with a swelling kernel at the core-reflector boundary is observed due to getter nonuniform distribution and oxidation, and high local concentration of splitted cesium.

Country/Int. Organization

Russian Federation

Author: Mr KINEV, Evgenii (Institute of Nuclear Materials)

Co-authors: Mr BARYBIN, Andrey (Institute of Nuclear Materials); Mrs GLUSHKOVA, Natalia (Institute of Nuclear Materials); Mr TSYGVINTSEV, Vladimir (Institute of Nuclear Materials)

Presenter: Mr KINEV, Evgenii (Institute of Nuclear Materials)

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