

International Conference on Fast Reactors and Related Fuel Cycles: Next Generation Nuclear Systems for Sustainable Development (FR17)



Contribution ID: 100

Type: POSTER

CALCULATION OF NEUTRONIC PARAMETERS IN SUPPORT OF A BOR-60 EXPERIMENTAL FA WITH MODERATING ELEMENTS

Wednesday, June 28, 2017 5:50 PM (1h 10m)

At present, different nuclear fuels (NF) to be used in advanced fast neutron reactors (AFR) are tested in the BOR-60 reactor. In such in-pile testing the top priority is to ensure the maximum possible compliance of the target NF irradiation parameters with the design operating parameters. The key monitored parameters in testing experimental fuel elements are the fuel burnup rate and linear heat rate that depend on the nuclear fission rate in the fuel elements.

Rather low enrichment of tested fuel compositions (as compared to BOR-60 standard fuel) and low neutron flux density (as compared to big fast neutron reactors) in the BOR-60 core make it difficult or even impossible to provide the target heat and fuel burnup rates of NF.

To increase the nuclear fission reaction rate in the experimental fuel elements it is suggested to install neutron moderating elements in an experimental fuel assembly (EFA).

We considered three EFA design options:

- Option 1: EFA contains 19 fuel elements and no moderating elements;
- Option 2: EFA contains 13 fuel elements and 6 moderating elements;
- Option 3: EFA contains 6 fuel elements and 13 moderating elements.

The outcome is a calculated data analysis confirming the effectiveness and safety of the suggested design solution. Patent #2560919 was obtained for this invention in 2015.

This EFA design option enables wider BOR-60 capabilities in testing advanced nuclear fuels due to high fuel burnup and heat rates in the experimental fuel elements.

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Session Classification: Poster Session 2

Track Classification: Track 6. Test Reactors, Experiments and Modeling and Simulations