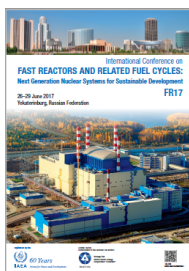


International Conference on Fast Reactors and Related Fuel Cycles: Next Generation Nuclear Systems for Sustainable Development (FR17)



Contribution ID: 265

Type: POSTER

Change in Mechanical Properties of Spent Fast Reactor Claddings

Tuesday, June 27, 2017 5:30 PM (1h 30m)

During fuel element operation changes in structure and physical and mechanical properties of the claddings are induced by irradiation and other factors. In particular, there are such changes as swelling, embrittlement, softening and corrosion damages. To predict cladding limit state it is necessary to know the changes occurred. In particular, it is important that cladding mechanical properties after operation are properly determined. In this respect there are different mechanical tests. Tensile test of annular cladding specimens is a conventional method. Test stress strain state essentially differs from that occurring in claddings during operation when they are subjected to gas pressure and deformation from the swelling fuel. Mechanical properties determined with annular sample tensile test are too conservative and cannot be used for a proper description of the cladding behaviour during operation.

At JSC "INM" a technique for mechanical testing with tough plastic aggregate internal pressure has been developed. Aggregate compression leads to its plastic deformation exerting internal pressure on the cladding tubular sample. Mechanical properties of the cladding material are calculated according to the recorded 'movement of aggregate compressing plungers - compression force' curve. During the test a loading pattern and a stress strain state of the cladding simulate its loading under irradiation in the reactor. Characteristics of tubular samples tested with internal pressure clearly demonstrate operated cladding behaviour.

The paper shows the results of the short-term mechanical properties change after irradiation in fast reactors obtained for the mentioned techniques. Mechanical characteristics after testing in different loading patterns are compared. Advantages and disadvantages of each technique and possibility of their integration to predict cladding behaviour during operation are pointed out.

Country/Int. Organization

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Session Classification: Poster Session 1

Track Classification: Track 5. Fast Reactor Materials (Fuels and Structures) and Technology