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## Examination of Fast Reactor Materials and Structural Elements at JSC “INM” Premises

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At the Institute of Nuclear Materials post irradiation examination has been carried out since BN-600 reactor commissioning to justify safety and reliability of different core elements during routine operation and to search for new ways of extending their service life. The examination is carried out in close cooperation with the design bureau (Afrikantov OKBM), nuclear operator (Beloyarsk NPP), materials testing enterprise (VNI-INM), fuel assembly manufacturer (MSZ) and other enterprises. It helps to use post irradiation examination results promptly to advance reactor structural elements and improve economic efficiency. Main aspects of the examination are as follows:

- examination of fuel elements and shroud tubes of standard, trial and test fuel assemblies;
- examination of reactor control and safety units (control rods including absorber elements and shroud tubes);
- examination of materials science assembly samples irradiated in BN-600 reactor;
- investigation of possible service life extension from 30 to 45, and then to 60 years.

The examination carried out at INM is unique because it is not limited with statement of fact of changes in structural elements and their material properties. The aim of the examination is to predict their further behaviour and find out the cause of the changes. It is not sufficient to carry out separate post irradiation examinations, there should be a systematic result set based upon theoretical concepts on the process mechanisms, descriptive modeling of structural evolution processes and corresponding changes in physical and mechanical properties. It is also necessary to improve existing examination techniques and develop new ones to obtain characteristics used to predict residual and limited life for core elements and the reactor as a whole. The paper aims to show the main results of BN-600 structural element examination at INM, demonstrate their practical application, and make a review on the developed theoretical concepts and the development of the techniques correlating with the examination.

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