Contribution ID: **319** Type: **ORAL**

LOW ENRICHMENT NUCLEAR FUEL BASED ON URANIUM-ZIRCONIUM CARBONITRIDE: REACTOR TESTS AND PREPARATION FOR STUDIES AT CRITICAL ASSEMBLIES

Friday 22 April 2022 14:18 (12 minutes)

Uranium-zirconium carbonitride has been developed at the LUCH FSUE and is a high-density high-temperature fuel with high heat conductivity capable of being used in various types of reactors, including fast reactors. The main problem hindering wide application of this fuel is insufficient knowledge of its behavior under irradiation, especially at high burnup. In the USSR, HEU UZrCN (96% by U-235) fuel underwent reactor testing to a low burnup of approximately 1%. However, to confirm practicality of application of this fuel, it needs to be reactor tested at a high burnup. In the framework of a joint Belarussian-American-Russian effort, LEU (19.75% by U-235) UZrCN fuel will undergo reactor testing to a burnup of approximately 40% in the SM-3 reactor at the JSC "SSC RIAR".

To conduct the prolonged reactor experiment, an irradiating device with an experimental capsule containing UZrCN pellets has been made, neutronic analysis and thermophysical analysis have been carried out and a programme of pre-irradiation experiments has been implemented.

In June 2019 a methodical experiment was carried out in the SM-3 reactor at the JSC "SSC RIAR"in order to confirm operability of the irradiating device developed. Testing of the irradiating device and refinement of the prolonged irradiation experiment procedure were carried out at cell 11 of the reflector of the SM-3 reactor at the JSC "SSC RIAR". The period of irradiation equaled 23.3 effective days. The mean power density in the tested pellets throughout the methodical reactor testing was 516 W/cm3. Burnup achieved for the pellets studied was 0.63% fifa.

The "Giacint"and "Kristal"critical facilities of the Scientific Institution "JIPNR - Sosny"will be used for studying neutronic characteristics of critical and subcritical fast assemblies simulating the physical particulars of the cores of advanced gas- or liquid metal cooled fast reactor systems and accelerator driven systems.

This paper provides a detailed description of the results of preparatory works for conducting the reactor testing and the results of the methodical reactor experiment. Also presented are the experimental programme and the descriptions of the design and composition of the fast critical assemblies with UZrCN fuel.

Country/Int. organization

Belarus

Authors: Mr SIKORIN, Svyatoslav (Nikolaevich); Mr KUZMIN, Andrei (The Joint Institute for Power and Nuclear Research-Sosny of the National Academy of Sciences of Belarus); Mr MANDZIK, Siarhei (The Joint Institute for Power and Nuclear Research-Sosny of the National Academy of Sciences of Belarus); Mr POLAZAU, Siarhei (The Joint Institute for Power and Nuclear Research-Sosny of the National Academy of Sciences of Belarus); Ms HRYHAROVICH, Tatsiana; Mr TUKHVATULIN, Shamil (LUCH Research and Production Association, Research and Development Institute, Federal State Unitary Enterprise); Mr GALEV, Ivan (LUCH Research and Production Association, Research and Development Institute, Federal State Unitary Enterprise); Mr BAKHIN, Andrei (LUCH Research and Production Association, Research and Development Institute, Federal State Unitary Enterprise); Mr VISHNEVSKY, Vyacheslav (LUCH Research and Production Association, Research and Development Institute, Federal State Unitary Enterprise); Mr MOKRUSHIN, Andrei (LUCH Research and Production Association, Research and Development Institute, Federal State Unitary Enterprise); IZHUTOV, Alexey (JSC "SSC RIAR"); KEISER, Dennis (Idaho National Laboratory); Mr BOLSHINSKY, Igor (Idaho National Laboratory); Mr GOHAR, Yousry (Argonne National Laboratory)

Presenter: Mr BAKHIN, Andrei (LUCH Research and Production Association, Research and Development Institute, Federal State Unitary Enterprise)

Session Classification: 3.4 Advanced Fuel Development

Track Classification: Track 3. Fuels, Fuel Cycles and Waste Management