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**Characterization Status of the LEU High Density Uranium Zirconium
Carbon Nitrogen Fuel for Different Utilizations**

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ABSTRACT

The in- and out-of-reactor characterization of the LEU high-density nuclear fuel for high temperature reactor applications are under way as a part of the Russian Research Reactor Fuel Return Program. The fuel material is uranium zirconium carbon nitrogen composite (U_{0.9}Zr_{0.1}C_{0.5}N_{0.5}) and its density is 11.9 g/cm³ density. The uranium density of this fuel material is 10.8 g/cm³. In-reactor high burnup tests using the SM-3 Russian reactor have been planned to confirm the performance of this fuel. Measurements of the fuel material properties and fuel material compatibility with Nb, W, Mo, and stainless steel are part of this characterization. To test the neutronics performance of this fuel material for use in different reactor systems, the GIACINT and the CRYSTAL critical facilities of Belarus have been used. These facilities are being upgraded to operate in critical and subcritical configurations using different moderator and reflector materials. The facilities control systems are designed to avoid any perturbation for the geometrical configurations. Several detectors outside the core configuration are used for measuring the neutron flux. Critical and subcritical configurations using this fuel have been examined experimentally and/or analytically. GIACINT experiments with water moderator simulating thermal reactors were successfully performed and analyzed. GIACINT and CRYSTAL configurations are being designed to simulate gas, sodium, and lead critical/subcritical reactors. This paper is focused on these reactor simulations.