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U.S. Progress in U-Mo Monolithic Fuel Qualification

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ABSTRACT

Based on results from scoping irradiation tests, U-Mo monolithic fuel was selected as the primary LEU conversion fuel for U.S. high performance research reactors (USHPRR). The fuel design consists of U-10Mo alloy foils having a Zr diffusion barrier coating clad in AA6061 by hot isostatic pressing. Development testing in the RERTR-12, AFIP-6, and AFIP-7 irradiation test campaigns confirmed that the selected U-Mo monolithic fuel system exhibits good irradiation behavior over the range of irradiation conditions required for the high performance research reactors licensed by the Nuclear Regulatory Commission (NRC) in the United States. A recent comprehensive review of the R&D conducted to date has shown that the U-Mo monolithic fuel system appears to meet the defined fuel performance requirements for generic fuel qualification. Based on these results, the USHPRR Conversion Project is proceeding with a series of fuel qualification campaigns, beginning with the MP-1 irradiation test starting in 2018. Planned tests include miniature-plate, full-size plate, and fuel element irradiations, during which the optimized commercial-scale fabrication processes will be qualified and fuel test specimens will be irradiated under conditions that bound the NRC-regulated reactors in order to demonstrate that all fuel performance requirements are satisfied. Other tests are planned under conditions that bound the higher power DOE-regulated reactors. Additional efforts are ongoing to define fuel performance limits through measurement and assessment of material properties, fuel performance modeling, and flow testing.