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

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ABSTRACT

Based on results from scoping irradiation tests, U-Mo monolithic fuel was selected for further development as the primary LEU conversion fuel for U.S. high performance research reactors (USHPRR). More focused testing in the RERTR-12, AFIP-6, and AFIP-7 irradiation test campaigns has confirmed that the U-Mo monolithic fuel system exhibits good irradiation behavior over the range of irradiation conditions required to support operation of high performance research reactors licensed by the Nuclear Regulatory Commission in the United States. Fuel plates from the RERTR-12 experiment, in particular, show stable behavior to very high burnup ($>1 \times 10^{22}$ local fission density) at high power density (18-40 KW/cm³ average), after which they failed by pillowing with no fission product release to the coolant. Based on these results, the USHPRR Conversion Program is proceeding with fuel qualification, beginning with the development of commercial-scale fabrication processes and selection of a fabrication process through the MinPlate-1 (MP-1) irradiation test. Fuel fabricated using the selected process will be qualified through a series of miniplate, full-size plate, and fuel element irradiations. Additional efforts are ongoing to define fuel performance limits through measurement and assessment of material properties, fuel performance modeling, and flow testing.