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Status of U-Mo Fuel Qualification Program & KJRR Project in Korea

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ABSTRACT

The KJRR project is to build a new research reactor under construction in Korea and aims at an increase in self-sufficiency in terms of medical and industrial radioisotope supply, an enlargement of silicon doping capacity and a build-up of research reactor technology in Korea. The reactor core will use 8 gU/cc U-Mo fuel, which will enable the achievement of 300 days of operation per year, an exit burn-up of higher than 60%, and the production of the required neutrons with a satisfaction of safety in view of the thermal-hydraulics, fuel performance, and inherent safety. The KJRR project is going to adapt a high density U-Mo dispersion fuel, which is the first challenge as a driver fuel in a research reactor in the world. Since the KJRR fuel will be the first of a kind engineering of U-Mo fuel for commercial utilization, it requires a license to be granted by a proper fuel qualification. First, the fuel assemblies were characterized and qualified mechanically by out-of-pile tests: modal test, flow-induced vibration test, tensile and bending test, drop velocity measurement test, critical flow velocity measurement of fuel plate, and vibration test of fuel assembly under reactor operating condition. Secondly, U-Mo fuel irradiation tests have been being implemented indigenously and with the co-operation of INL and ANL. The irradiation test of lead test assembly (LTA) of U-Mo fuel was completed successfully in the Advanced Test Reactor (ATR) of INL with 216.6 EFPD and max 83% U-235 depletion. The irradiated LTA was transported after 11 months of cooling in the ATR canal to Hot Fuel Examination Facility (HFEF) of INL. The PIE on the irradiated LTA has been launched in Feb. 2018 and non-destructive PIE has been undergoing currently. Visual examination confirmed the LTA integrity during the irradiation without any abnormalities in the geometric stability. In addition to the LTA irradiation qualification, the first mini-plate irradiation test (HAMP-1) was completed in HANARO at KAERI with max 65 % U-235 depletion. The PIE on HAMP-1 mini-plates revealed that there were not any abnormalities during the irradiation. The second and third test series (HAMP-2 and HAMP-3) will be also commenced in the nearest future.