

Irradiation Test of MOX Fuel in the Halden Reactor During the First
Cycle and Its Analysis with a Computer Code COSMOS

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Abstract

Two MOX fuel rods (MOX-ATT-TF and MOX-ATT-ET), which were fabricated in PSI by attrition milling method, are being irradiated in the Halden Boiling Water Reactor (HBWR) together with a MOX fuel provided by BNFL. The two MOX fuels have been successfully irradiated during the first irradiation cycle of June to October 2000, during which the average linear heating rate was 200-250 W/cm and the burnup reached ~5 MWd/kgHM. The irradiation test will continue up to a burnup of about 50 MWd/kgHM. MOX-ATT-TF rod is instrumented with TF while MOX-ATT-ET has ET at the top end. Both rods have PF at the bottom end. In addition, MOX-ATT-TF fuel is instrumented with EF at the top of the fuel stack. The densification is ~2% for MOX-ATT-TF and ~1% for MOX-ATT-ET, respectively. On the other hand, the densification estimated by EF measurement is ~0.2%, which is much lower than the one from PF. This is because PF is sensitive to the change in the volume of the entire fuel stack, whereas EF reflects the change at the edge of the pellet dish. This difference means that the significant densification occurs in the hot-dished region. For the analysis of irradiation results, a computer code COSMOS was used and its capability was verified. The predicted thermal behaviour and rod internal pressure show good agreement with the measured data.