

Integrated Thermal/Mechanical Analysis of Assembly and Irradiation of Annular, LEU-foil Based Target

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ABSTRACT

The thermal- mechanical safety analysis of a low-enriched uranium foil based annular target for molybdenum-99 production will be presented. The target constitutes a low enriched uranium foil sandwiched between two concentric aluminum tubes to form a composite cylindrical structure. A three-step numerical model is built using the commercial finite element code Abaqus FEA to simulate the assembly process, obtain the residual stresses, and simulate the in-vessel irradiation of the annular target. Due to the three-step modeling approach, the residual stresses from the assembly process are automatically used as initial inputs to the thermal- mechanical irradiation model. The safety acceptance criteria assumed that the thermally induced stresses and the temperatures in the cladding, after irradiation, would be within the yield strength and the melting point of the cladding material respectively. Discussions of the safety analysis results and the thermal-mechanical stress margins will be provided.