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European developments for monolithic UMo fuel: A status report

H. Breitkreutz, Ch. Steyer, B. Baumeister, W. Petry
Forschungs-Neutronenquelle Heinz Maier-Leibnitz (FRM II)
Technische Universität München, Lichtenbergstr. 1, 85747 Garching – Germany

B. Stepnik, M. Grasse, C. Rontard, D. Geslin, Y. Guinard,
AREVA-NP – CERCA
10 Rue Juliette Récamier, 69456 Lyon Cedex 06 – France

ABSTRACT

In the framework of the joint international efforts to minimize the use of highly enriched uranium, two variants of a research reactor fuel based on uranium-molybdenum (UMo) alloys are being developed. The European HERACLES consortium historically focused on dispersion UMo fuel, while the US DOE put emphasis on the monolithic variant. Within the strong collaboration of these institutions, significant contributions were also made from the US program to the dispersion fuel and vice versa from the HERACLES program to the monolithic developments.

This paper summarizes the recent European developments for monolithic UMo fuel, namely the TUM PVD coating process and AREVA NP/CERCA C2TWP plate fabrication. The combination of both has been used to successfully manufacture the monolithic EMPIrE plates, which have been characterized in high detail using optical microscopy, SEM, FE-analysis, neutron diffraction etc.

The upcoming development steps are the upscaling from mini- to full-size and the industrialization of both processes. Alongside the development of new production processes for surrogate and UMo foils with thickness gradient, the adaption of both processes for such foils has been started.