IRRADIATION CREEP OF DISPERSION STRENGTHENED COPPER ALLOY —
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EXTENDED ABSTRACT

Dispersion strengthened copper alloys are under consideration as reference materials for the ITER plasma facing components. Irradiation creep is one of the parameters which must be assessed because of its importance for the lifetime prediction of these components.

In this study the irradiation creep of a dispersion strengthened copper (DS) alloy has been investigated. The alloy selected for evaluation, MAGT-0.2, which contains 0.2 wt.% Al_2O_3, is very similar to the GlidCop™ alloy referred to as Al20. Irradiation creep was investigated using He pressurized tubes. The tubes were machined from rod stock, then stainless steel caps were brazed onto the end of each tube. The creep specimens were pressurized by use of ultra-pure He and the stainless steel caps subsequently sealed by laser welding.

These specimens were irradiated in reactor water in the core position of the SM-2 reactors to a fluence level of 4.5-7.1 $\times 10^{21}$ n/cm^2 (E>0.1 MeV), which corresponds to ~3-5 dpa. The irradiation temperature ranged from 60-90°C, which yielded calculated hoop stresses from 39-117 MPa. A mechanical micrometer system was used to measure the outer diameter of the specimens before and after irradiation, with an accuracy of ±0.001 mm.

The irradiation creep was calculated based on the change in the diameter. Comparison of pre- and post-irradiation diameter measurements indicates that irradiation induced creep is indeed observed in this alloy at low temperatures, with a creep rate as high as ~2×10^{-9} s^{-1}. These results are compared with available data for irradiation creep for stainless steels, pure copper, and for thermal creep of copper alloys.