BRASKI

DOE/ET-0058/7

Alloy Development for Irradiation Performance

Quarterly Progress Report

For Period Ending September 30, 1979

U.S. Department of Energy

Assistant Secretary for Energy Technology

Office of Fusion Energy

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The apparatus and techniques required to carry out postirradiation tensile tests on miniaturized wire specimens have been developed and tested. Results of tests on nine AISI 316 stainless steel wire specimens demonstrate that the test machine operates in a reproducible manner and that the specimen geometry yields results comparable to conventional specimens.

This report will briefly describe the apparatus, specimen geometry and preliminary test results.

Work is now in progress to extend our previously reported fatigue data to the high-cycle regime. We have tested control specimens before testing irradiated specimens. Data from the high-cycle tests correlate well with low-cycle strain controlled data for control specimens.

Previous work identified inhomogeneity in the as-received Path A Prime Candidate Alloy (PCA) plate stocks (and probably other finished forms as well). Fabrication experiments indicated that hot working had produced titanium-rich MC precipitation and that although initially fine and uniform, this phase could coarsen during further hot working. Solution treating to dissolve titanium-rich MC precipitate particles requires temperatures above 1150°C. The Ti(C,N)S and titanium-rich MN particles dissolve only at temperatures near melting, if at all. Homogenization before fabrication is essential. Our investigations addressed and solved all the problems encountered when producing final form material for specimens [0.25-mm-thick transmission electron microscope (TEM) discs punched from sheet]. Sheet 0.5 mm thick was also fabricated for thermal aging response studies of the Path A PCA.

Thermal aging of the Prime Candidate Alloy (PCA) with no cold working and with 10 and 25% cold working for time-temperature-precipitation (TTP) curve determination shows that MC precipitate particle distribution, either at the grain boundary or in the matrix, is considerably more sensitive to initial dislocation density than to either time

The status of the molten-salt thermal-convection loops (LiF-BeF_2, KNO_3-$NaNO_2$-$NaNO_3$, and LiF-LiBr-LiCl) is reviewed. The corrosion rates of type 316 stainless steel in KNO_3-$NaNO_2$-$NaNO_3$ and the composition of the salt are reported as a function of time and temperature. Corrosion rates varied from about 5 mg/m^2h (4 μm/year) at 430°C to 66 mg/m^2h (59 μm/year) at 550°C.