

IN-SITU NEUTRON DIFFRACTION MEASUREMENTS DURING CREEP TESTING OF BERYLLIUM

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ABSTRACT

Recent residual stress measurements of welded beryllium parts have shown that residual stresses relaxed considerably during a thermal cycle of the material. Relaxation was not expected and the only viable mechanism seems to be creep. *In situ* time-of-flight neutron diffraction was used during constant-load tensile creep of beryllium at room temperature, 200 °C and 450 °C. The macroscopic and lattice strains were measured simultaneously during creep using a high temperature extensometer and neutron diffraction, respectively. Measuring the *hkl*-specific lattice strains with time was done to gain insights into the plastic anisotropy at various stages of creep deformation (*i.e.*, primary, secondary, and tertiary regimes). During constant-load tensile creep test, specimens were held at loads up to the yield strength. Results show an increase in peak breadth with plastic strain however, after subsequent heating it is clear that recovery (or annealing) of damage (dislocations) is achieved between 450 °C and 500 °C.

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