The Independence of Irradiation Creep in Austenitic Alloys of Displacement Rate and Helium to dpa Ratio - F. A. Garner and M. B. Toloczko (Pacific Northwest National Laboratory, Richland, WA) and M. L. Grossbeck (Oak Ridge National Laboratory, Oak Ridge, TN)

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Extended Abstract

The majority of high fluence data on the void swelling and irradiation creep of austenitic steels were generated at relatively high displacement rates and relatively low helium/dpa levels that are not characteristic of the conditions anticipated in ITER and other anticipated fusion environments.

After reanalyzing the available data, this paper shows that irradiation creep is not directly sensitive to either the helium/dpa ratio or the displacement rate, other than through their possible influence on void swelling, since one component of the irradiation creep rate varies with to the instantaneous swelling rate.

Until recently, however, the non-swelling-related creep component was also thought to exhibit its own strong dependence on displacement rate, increasing at lower fluxes. This perception originally arose from the work of Lewthwaite and Mosedale at temperatures in the 270-350°C range. More recently this perception was thought to extend to higher irradiation temperatures.

It now appears, however, that this interpretation is incorrect, and in fact the steady-state value of the non-swelling component of irradiation creep is actually insensitive to displacement rate. The preceived flux dependence appears to arise from a failure to properly interpret the impact of the transient regime of irradiation creep.