THE COMPOSITIONAL DEPENDENCE OF IRRADIATION CREEP OF AUSTENITIC ALLOYS IRRADIATED IN PFR AT 420°C — M. B. Toloczko and F. A. Garner (Pacific Northwest National Laboratory), J. Standring (UKAEA, United Kingdom, retired), B. Munro and S. Adaway (AEA Technology, Dounreay, Scotland)

To be presented at the 8th International Conference on Fusion Reactor Materials in Sendai, Japan, October 1997.

Extended Abstract

Irradiation creep data are expensive and often difficult to obtain, especially when compared to swelling data. This requires that maximum use be made of available data sources in order to elucidate the parametric dependencies of irradiation creep for application to new alloys and to new environments such as those of proposed fusion environments.

One previously untapped source of creep data is that of a joint U.S./U.K. experiment conducted in the Prototype Fast Reactor (PFR) in Dounreay, Scotland. In this experiment, five austenitic steels were irradiated in a variety of starting conditions. In particular, these steels spanned a large range (15-40%) of nickel contents, and contained strong variations in Mo, Ti, Al, and Nb. Some alloys were solution-strengthened and some were precipitation-strengthened. Several were cold-worked.

These previously unanalyzed data show that at 420°C all austenitic steels have a creep compliance that is roughly independent of the composition of the steel at $2 \pm 1 \times 10^{-6}$ MPa^{-1} dpa^{-1}. The variation within this range may arise from our inability to completely separate the non-creep strains arising from precipitation reactions and the stress-enhancement of swelling. Each of these can be very sensitive to the composition and starting treatment of a steel.