

Significance of primary irradiation creep in graphite

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Abstract

Traditionally primary irradiation creep is introduced into graphite analysis by applying the appropriate amount of creep strain to the model at the initial time-step. This is valid for graphite components that are subjected to high fast neutron flux fields and constant stress fields, but it does not allow for the effect of movement of stress locations around a graphite component during life, nor does it allow primary creep to be applied rate-dependently to graphite components subject to lower fast neutron flux. This paper shows that a differential form of primary irradiation creep in graphite combined with the secondary creep formulation proposed by Kennedy et al. performs well when predicting creep behaviour in experimental samples. The significance of primary irradiation creep in particular in regions with lower flux is investigated. It is shown that in low flux regions with a realistic operating lifetime primary irradiation creep is significant and is larger than secondary irradiation creep.