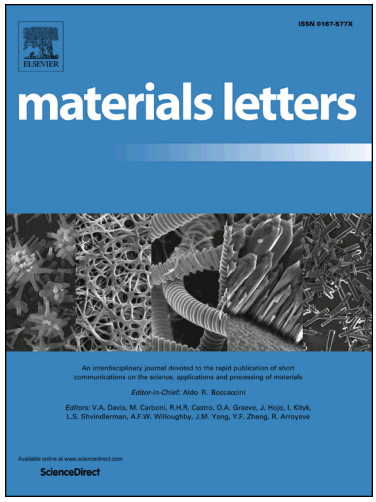

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Influence of W and effect of loading mode on the substructural evolution of reduced activation ferritic/martensitic (RAFM) steels

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Abstract

Influence of tungsten (W) on the evolution of substructure during creep-fatigue interaction (CFI) and effect of loading mode in terms of continuous cycling (CC) and CFI at 823 K of reduced activation ferritic/martensitic (RAFM) steels has been investigated. Increase in W from 1.4 to 2 wt.% resulted in an improvement of 1.6 times of CFI life. Electron back scatter diffraction (EBSD) analysis of CFI deformed specimens demonstrated that the subgrain size was 1.8 times smaller and boundary dislocation density was 3 times higher in case of 2wt.% W steel compared to 1.4wt.% W. It can be deduced that W addition resulted in decrease in the recovery rate and enhancing the CFI life. In context to loading mode, the subgrain size was 1.5 times higher and dislocation density was 2 times lower in case of CC tested specimen with respect to CFI tested. Under CFI, the number of cycles to failure were drastically reduced due to the synergistic damage of cyclic loading and creep deformation.

Keywords: Fatigue; Grain boundaries; Microstructure; Deformation and fracture; Electron microscopy; Creep-fatigue interaction