CREEP-FATIGUE INTERACTIONS IN ALLOY 800H

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Abstract

Four heats of Alloy 800H have been tested using strain-controlled cyclic loading with constant strain hold periods in each cycle at five temperatures ranging from 538°C to 760°C. Under conditions most likely to be encountered in components, low strain ranges and temperatures where the creep strength is relatively high, single compressive strain holds in each cycle were more damaging than single tensile strain holds in each cycle. However, in one heat that had low creep strength, single tensile strain holds were always more damaging than single compressive strain holds. Cycles with both tensile and compressive strain holds in each cycle were the most damaging of all. Crack initiation was studied by carrying out SEM examination of specimen surfaces from tests where there were intermittent interruptions, and this showed that imposition of constant strain holds into the loading cycle had very little effect, if at all, on the number of cycles to crack initiation. Fracture surface examinations showed that cycles with single compressive strain holds and cycles with both compressive and tensile strain holds produced the same crack propagation mechanism as low-cycle fatigue. Cycles with single tensile strain holds produced a completely different crack propagation mechanism.