

Modelling Short Crack Propagation under Variable Structural and Thermal Loadings

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Abstract

Concepts for crack propagation as well as fatigue assessment under variable mechanical and thermal loadings are unestablished. For variable mechanical loadings, the damage parameter P_J is well known, for thermal loadings the damage parameter D_{TMF} is established. Both parameters base on the effective cyclic J-Integral, still the definition is different. The damage parameters P_J considers the effective stress and strain ranges from the upper reversal point of each load cycle to the point of crack closure. Depending on the loading sequence the point of crack closure is treated as a history variable. In addition, with a crack length dependant fatigue limit, the most important sequence effects are considered. A new P_J -based concept is developed by considering additional sequence effects. In comparison to experimental results, the developed concept is able to reduce scattering in the range of constant amplitude loading tests.

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