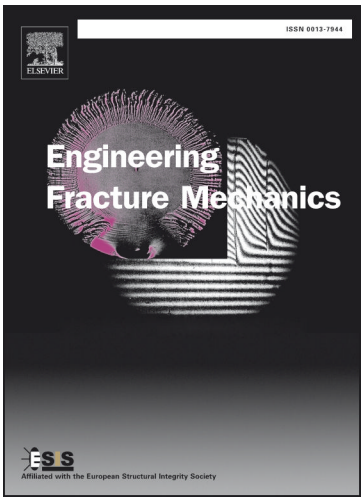

Threshold Stress Intensity Factor Range of a Mechanically-long and Microstructually-short Crack Perpendicular to an Interfacewith Plastic Mismatch

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Abstract

In this study, we investigated long fatigue crack growth perpendicular to a soft-hard material interface comprising the same Young's moduli but different yield strengths. We determined the degree of fatigue crack growth retardation attributable to the interface under the constant stress intensity factor range (ΔK) using the plasticity-induced crack closure analysis with the Dugdale model. We subsequently determined the threshold stress intensity factor range (ΔK_{th}) under a constant stress amplitude (σ_a). Under a constant ΔK, the retardation degree was primary dependent on the two materials' yield strength ratio. Under a constant σ_a, ΔK_{th} was dependent on both the yield strength ratio and the distance between initial crack tip and interface.

Keywords: Threshold stress intensity factor range, bi-material interface, plasticity-induced crack closure, Dugdale model