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Abstract

The present study is concerned with non-statistical size effects on fatigue crack growth. Past studies have discussed this issue in the context of crack size dependent Paris laws but retain a crack propagation type failure. In the present study, it is demonstrated that as structural size is reduced or as a crack extends, fatigue failure of cracked structures no longer occurs by crack propagation but by transitions to uniform debonding. The consequences of this finding on fatigue failure and threshold conditions are studied. A fatigue cohesive zone model is applied to demonstrate this finding. It is demonstrated that in fatigue loading the evolution of the internal cohesive length scale needs to be accounted for.

Keywords

Size effects, Cohesive zone model, Fatigue crack growth