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Abstract

Design of several metallic structural components, for instance in aerospace applications, should take into account the physically short crack behaviour. By characterising a fracture surface using fractals concepts, crack growth models similar to that proposed by Frost and Dugdale in 1958 and Hartman and Schjive in 1970 can be obtained. For short cracks, these models predict exponential crack growth with respect to the applied load history, and that has led to a practical aircraft lifing approach known as the lead crack framework. The present paper describes the fractality of metallic fracture surfaces and the crack growth behaviour in some fatigue tests.

Keywords: Fatigue crack growth; Fractal geometry; Short crack regime.

1. Introduction

The physically short crack regime in metals has been examined particularly in aerospace applications over the last decades. A short crack is characterized by: (i) crack growth rate (da/dN) higher than that of a long crack, for a given stress intensity range ΔK; (ii) often a

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