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Nucleation and early crack path in fretting fatigue

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ABSTRACT

The initial crack path is analysed in a series of fretting fatigue tests with cylindrical contact. In such tests, both specimens and pads are made of Al7075-T651 alloy and a non-proportional multiaxial stress state with a significant stress gradient is present. The crack initiation path along the fracture surface is optically measured using a focus variation technique. The contact stress/strain fields analytically obtained, in conjunction with either the Fatemi-Socie (FS) or Smith-Watson-Topper (SWT) multiaxial fatigue parameters, allow us to determine the controlling parameters of the crack initiation process observed in the tests, and to estimate the crack path during the early stage of the crack growth. These estimations are compared with the experimental results. Finally, a fracture mechanics approach is also employed where the crack paths measured are compared with the stress intensity factor (SIF) of cracks with different lengths and orientations showing also good results.

Keywords: Crack initiation; crack path; cylindrical contact; fretting; multiaxial fatigue.

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