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Carlos A. Molina, Mirco D. Chapetti

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Estimation of high cycle fatigue behaviour using a threshold curve concept

Carlos A. Molina* and Mirco D. Chapetti

Laboratory of Experimental Mechanics (LABMEX)

INTEMA (Institute for Material Science and Technology)

CONICET - University of Mar del Plata

J.B. Justo 4302, (B7608FDQ) Mar del Plata, Argentina

*corresponding author: carlosmolina@fi.mdp.edu.ar

Abstract

Estimation of short crack propagation rates has proven to be a key factor in design and maintenance of metallic components subjected to loading conditions related to high cycle fatigue (HCF). Extrapolation of long crack fracture mechanics approaches fails to correlate short crack behaviour, since crack length dependence of the short crack propagation threshold is not accounted for. In this paper, a fracture mechanics approach for prediction of HCF behaviour involving short cracks is analysed. The method is defined through application of the resistance curve concept and a short crack propagation threshold prediction model. Different threshold estimation methods are reviewed and compared. Application of the proposed model is exemplified and results of predicted crack propagation rates and estimated fatigue lives are presented and discussed.

Keywords: High cycle fatigue, Short cracks, Threshold, Design, Fracture mechanics

Nomenclature

a crack length

C, C^* environmentally sensitive material constant

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