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Non-propagating cracks in notched components at the fatigue limit analysed with a microstructural model

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Abstract

The presence of non-propagating cracks at notches subjected to cyclic loads around the fatigue limit is well known. The basic reason for their formation is the existence of a stress gradient created by the notch, which can initiate a crack but not its propagation through the solid. In this paper, the application of the Navarro and de los Rios microstructural model (NR model) for the length prediction of non-propagating cracks is presented. A simplified version of the NR model has been used, that basically requires the elastic gradient in front of the notch, which can be easily achieved using finite element analysis. The model correctly predicts the difference in length of non-propagating cracks between sharp and blunt notches and between small, medium and large notches. Finally, the non-propagating crack lengths taken from the literature have been analysed, and the predictions provided by the model are relatively close.

Key words: Non-propagating crack, Fatigue limit, Notch, Fracture Mechanics, Stress gradient.