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CALCULATION OF THE WÖHLER (S-N) CURVE USING A TWO-SCALE MODEL

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Abstract: This paper deals with the initiation of a short crack and subsequent growth of the long crack in a carbon steel under cyclic loading, concluded with the estimation of the complete lifetime represented by the Wöhler (*S-N*) curve. A micro-model containing the microstructure of the material is generated using the Finite Element Method and the according non-uniform stress distribution is calculated afterwards. The number of cycles needed for crack initiation is estimated on the basis of the stress distribution in the microstructural model and by applying the physically-based Tanaka-Mura model. The long crack growth is handled using the Paris law. The analysis yields good agreement with experimental results from literature.

Keywords: Multiscale modelling, Fatigue, Crack initiation, Lifetime estimation, Wöhler (*S-N*) curve

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