

Cycle Number Estimation Method on Fatigue Crack Initiation Using Voronoi Tessellation and the Tanaka Mura Model

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Abstract : This paper deals with the short crack initiation of the material P91 under cyclic loading at two different temperatures, concluded with the estimation of the short crack initiation Wöhler (S/N) curve. An artificial but representative model microstructure was generated using Voronoi tessellation and the Finite Element Method, and the non-uniform stress distribution was calculated accordingly afterward. The number of cycles needed for crack initiation is estimated on the basis of the stress distribution in the model by applying the physically-based Tanaka-Mura model. Initial results show that the number of cycles to generate crack initiation is strongly correlated with temperature.

Keywords : short crack initiation, P91, Wöhler curve, Voronoi tessellation, Tanaka-Mura model

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