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Generalized Evaluation Method for Determining Transition Crack Length for Microstructurally Small to Microstructurally Large Fatigue Crack Growth: Experimental Definition, Facilitation, and Validation

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Abstract

We proposed a generalized method to determine the transition crack length from a microstructurally small to a microstructurally large crack growth, l_0 . Artificial errors are minimized in the data analysis process of the proposed method. In this study, we used low carbon steel specimens, each with eight micro notches (the ferrite grain size was 25 μm). The micro notches were introduced by focused ion beam technique, which is regarded as pre-cracks in steel. The obtained l_0 (188 μm) agrees with previous studies. With the present specimen geometry, l_0 can be determined using two specimens—an approach that is much easier than conventional methods.

Keywords: fatigue crack growth; microstructurally small crack; probabilistic analysis; focused ion beam

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