

Comparative evaluation of fatigue life estimation under variable amplitude loading through damage models based on entropy.

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Abstract

Three fatigue damage models based on entropy, originally developed for constant amplitude loading, were assessed and compared each other in order to state whether its applicability can be extended towards variable amplitude loading conditions. A variable amplitude loading history, applied on a 2024-T3 aluminum alloy reported in the literature, was processed using both rainflow cycle counting and spectral techniques to transform it into a distribution of simple processes with constant amplitudes, then the damage models were assessed under the new loading conditions. The results showed that the model by Khonsari, combined with the rainflow technique, exhibited the highest accuracy with respect to the referenced experimental results with -0.67 standard deviation from the average data and 16% error from the median. Therefore, it is possible to assess the fatigue damage accumulation in metallic materials under variable amplitude loading through a thermodynamic approach with models developed for constant amplitude loading.

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