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Abstract:

The mean stress has a significant effect on crack propagation life and must be included in prediction models. However, there is no consensus in the fatigue community regarding the dominant mechanism explaining the mean stress effect. The concept of crack closure has been widely used and several empirical models can be found in literature. The stress ratio, R, is usually the main parameter of these models, but present numerical results showed a significant influence of Kmax. A new empirical model is therefore proposed here, dependent on Kmax and ΔK, with four empirical constants. The model also includes the effect of material's yield stress, and two additional parameters were defined to account for stress state and crack closure parameter. A comparison was made with Kujawski's and Glinka's parameters, for a wide range of loading conditions. ΔKeff lies between Kujawski's and Glinka's parameters, and some agreement is evident, although the concepts are quite different. The crack opening model was applied to literature results and was able to collapse da/dN–ΔK curves for different stress ratios to a single master curve