A multiaxial prediction equation of low/medium/high cycle fatigue life of metallic materials for plain and notch components

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Abstract

In this paper, it is important to illustrate that, for the LCF of metallic materials, a "stress quantity" calculated based on the *linear-elastic analysis* of the studied component is taken to be a *mechanical quantity, S*, to establish a relation of the *mechanical quantity, S,* to the fatigue life, *N*, is practicable. Based on the practicability, a prediction equation, for a low/medium/high cycle fatigue life assessment of metallic materials, is proposed. The prediction equation is a stress invariant based one, in which the computation of stress invariant is on the basis of the *linear-elastic analysis* of the studied component. Using experimental data of plain specimens reported in literature, it is proved that the prediction equation is both accurate and high efficient. In addition, the prediction equation in conjunction with the Theory of Critical Distances and *linear-elastic notch mechanics* are combined to establish the fatigue life estimation equation of the notched components. Finally, using experimental data of the fatigue life of 16MnR steel, validation verification of the notch fatigue life prediction equation is given.

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