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Defect Tolerance under Fatigue and Environmentally-Assisted Cracking Conditions

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Abstract

Semi-empirical notch sensitivity factors q have been used for a long time to quantify notch effects in fatigue design. Recently, this old concept has been mechanically remodeled using sound stress analysis techniques to calculate q values from the basic fatigue properties of the material, its fatigue limit and its fatigue crack propagation threshold, properly considering the notch tip stress gradient influence on the fatigue behavior of mechanically short cracks. This model can thus consider all the loading and notch geometry characteristics without the need for any data fitting parameter. Moreover, its predictions have been validated by proper tests, and a criterion to accept tolerable short cracks has been proposed based on it. This same mechanics is then extended to quantify notch sensitivity effects in environmentally assisted cracking problems, and its predictions are verified by proper tests as well.

