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Title:

On tolerable short cracks under fatigue and environmentally assisted cracking loading conditions

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Semi-empirical notch sensitivity factors q have been used for a long time to quantify notch effects on fatigue design. Recently, this old concept has been mechanically modeled using sound stress analysis techniques which properly consider the notch tip stress gradient influence on the fatigue behavior of mechanically short cracks. This mechanical model properly calculates q values from the basic fatigue resistances of the material, its fatigue limit and crack propagation threshold, considering all the characteristics of the notch geometry and of the loading, without the need for any adjustable parameter. The criteria to estimate notch sensitivity effects and to accept tolerable short cracks on fatigue have been extended in environmentally assisted cracking (EAC) conditions and experimentally verified by proper tests. In its simplest version, the criterion for the maximum tolerable stress under SCC conditions can be proposed as:

$$\sigma_{max} \le K_{IEAC} \Big/ \left\{ \sqrt{\pi a} \cdot g(a/w) \cdot \left[1 + (a_{0EAC}/a)^{\gamma/2} \right]^{1/\gamma} \right\}, \quad a_{0EAC} = (1/\pi)\left[K_{IEAC}/(\eta \cdot S_{EAC}) \right]^2 \quad (1)$$

where S_{EAC} and K_{IEAC} are the resistances to crack initiation and to large crack propagation and a_{0EAC} is the characteristic short crack size under EAC, a is crack size, $g(a/w)$ and η quantify the geometry and free surface influences on the crack stress intensity factor, and γ is an optional data fitting parameter, which otherwise is assumed $\gamma = 1$. Moreover, the tolerance to short cracks on fatigue and on EAC conditions can be unified in an extended Kitagawa diagram, as shown in Fig. 1. This work further extends these modeling procedures to consider 3D effects on the tolerance to short surface cracks and the effect of specimen thickness and of its notch geometry on their behavior.

[1] Castro,JTP; Landim,RV; Leite,JCC; Meggiolaro,MA. Prediction of Notch Sensitivity Effects in Fatigue and EAC, in print, FFEMS 2013.
[2] Castro,JTP; Meggiolaro,MA; Miranda,ACO; Wu,H; Imad,A; Nouredine,B. Prediction of fatigue crack initiation lives at elongated notch roots using short crack concepts, Int Journal Fatigue 42:172-182, 2012.
[3] Meggiolaro,MA; Miranda,ACO; Castro,JTP. Short crack threshold estimates to predict notch sensitivity factors in fatigue, Int Journal Fatigue 29:2022–2031, 2007.

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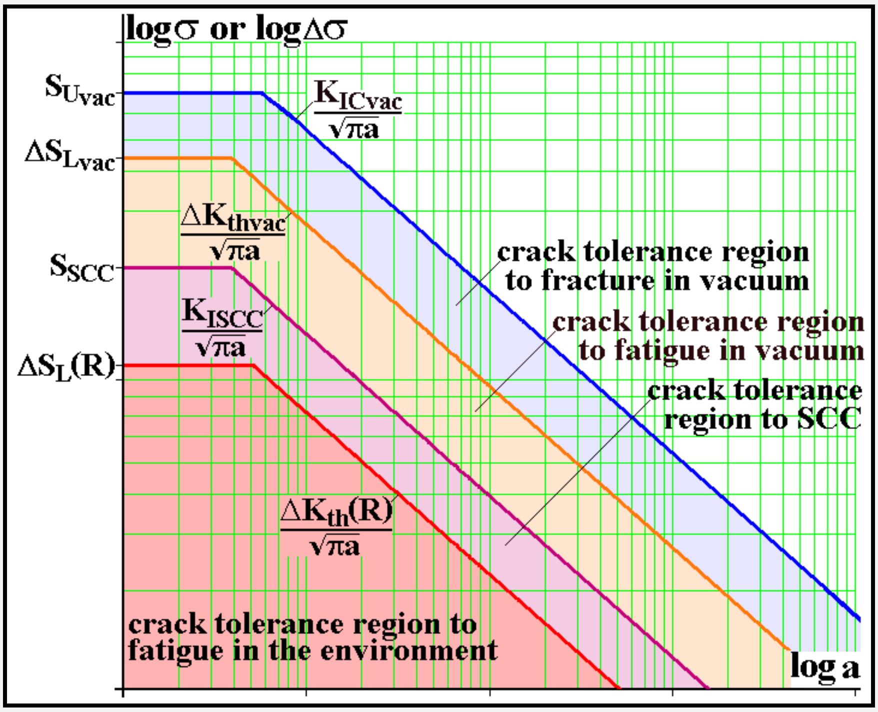

Fig. 1: Extended Kitagawa diagram including fatigue and SCC limiting conditions for crack growth.