3D analysis for pit evolution and pit-to-crack transition during corrosion fatigue

腐蚀疲劳点蚀演化与点蚀–裂纹转化的三维模型

Citation: Xiao-guang Huang, Jin-quan Xu, 2013. 3D analysis for pit evolution and pit-to-crack transition during corrosion fatigue. *Journal of Zhejiang University-SCIENCE A (Appl Phys & Eng)*, 14(4):292-299. [doi:10.1631/jzus.A1200273]

Main goal of this paper

The energy-based method is proposed to model the morphology evolution of pits during corrosion fatigue and to determine the crack-nucleation life.

Main aspects involved in the energy-based method

Establishment of 3D pit model, variation of thermodynamic potential, evolving morphology, sensitivity analysis, crack nucleation

Main procedure

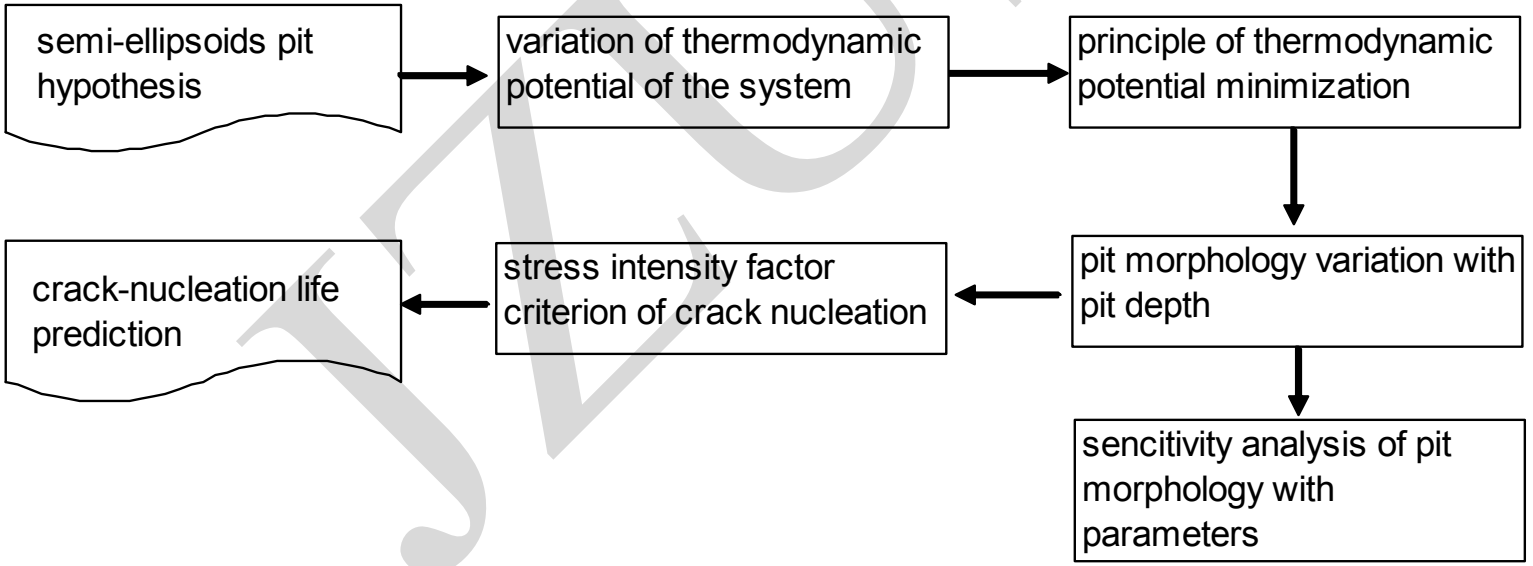
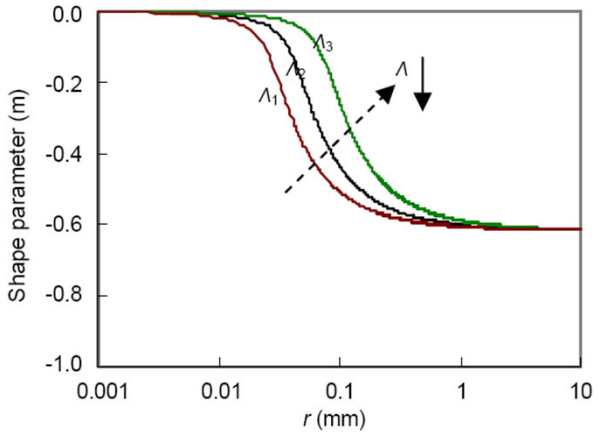
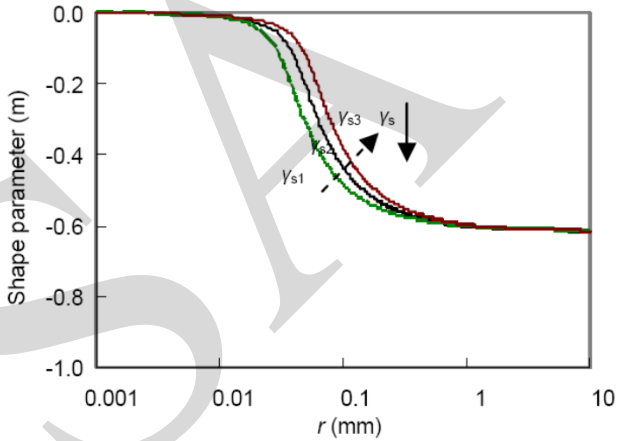


Fig. 1 Overall flow for energy-based method

Main results

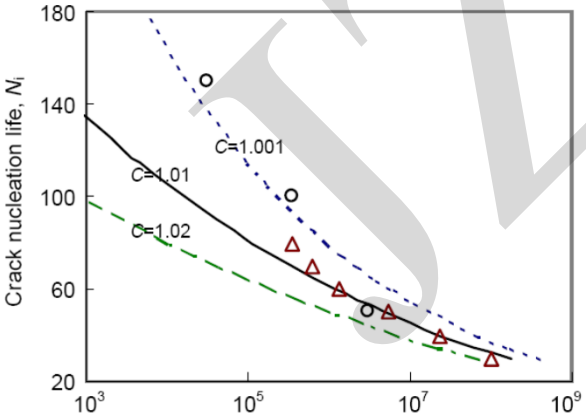
The evolving morphology of pit





The morphology of the initial pit is approximately a hemisphere and the pit morphology gradually evolves into a semi-ellipsoidal with shape parameter close to a stable value.

The crack nucleation life model



The crack nucleation life decreases with increasing stress levels, for critical pit depth being inversely proportional to the stress amplitude. We can see that crack initiation from relatively small pits at higher stress levels.