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疲劳裂纹扩展随机过程的统计分析

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STATISTICAL ANALYSIS TO RANDOM PROCESS OF FATIGUE CRACK PROPAGATION

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摘要 证明了两种疲劳裂纹扩展随机模型 (即以时间为参量的随机过程模型和以裂纹长度为参量的随机过程模型)在描述裂纹扩展随机过程方面的统一性。建立了由试验数据估计平稳对数正态随机过程相关参数的方法,可以直接由试验数据估计疲劳裂纹扩展随机过程的相关参数。针对 4 种机型含紧固孔试件谱载荷下的疲劳裂纹扩展试验数据,给出了用文中方法估计的相关参数和用随机模拟法估算的置信区间。

关键词： 裂纹扩展 参数估计 可靠性 概率断裂力学

Abstract： The fatigue crack growth lognormal random process model based on time and the model based on crack length are usually used in the reliability and damage tolerance analysis. These models are identical under special conditions. Based on these models, a new method of evaluating the auto correlative parameter in the usual stationary normal random process by the experimental data is established. Using this method, the value of the correlative parameter can be evaluated directly on the basis of the experimental data. At the same time, the confidence interval of the parameters is obtained by using Monte Carlo method. At the end, a numerical example is given. In this example, four groups of experimental data of the specimens with fastening holes under pseudorandom spectrum loading, those obtained from 93 specimens, are used to determine correlative parameters.

Keywords： crack p ropagat ion parameter est imat ions reliability p robability fracture mechanics

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