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2.25Cr-1Mo合金钢400℃下表面疲劳短裂纹群体演化行为研究及计算机模拟

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COLLECTIVE EVOLUTION STUDY AND NUMERICAL SIMULATION OF SURFACE SHORT FATIGUE CRACKS OF 2.25Cr-1Mo AT 400℃

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摘要 依据 2.2 5 Cr-1 Mo合金钢多种条件下表面疲劳短裂纹的实验分析结果,提出了一种表面随机分布短裂纹群体演化行为模型,模型计及了材料细观组织的障碍作用及裂纹相互之间的干涉效应。并用该模型对2.2 5 Cr-1 Mo材料表面疲劳短裂纹萌生、扩展及合体的全过程进行了数值模拟分析,结果表明短裂纹统计数据的模拟结果与实验结果基本一致。还对单条短裂纹行为进行了模拟分析

关键词： 疲劳裂纹 表面裂纹 萌生与扩展 数值模拟

Abstract： The behavior of short cracks charges the damage process of high-temperature fatigue, and the study on short fatigue crack is of great importance. Based on experiment of 2.25Cr-1Mo material's short cracks' collective evolution behavior, a stochastic physical model was proposed for visualizing the spatial and temporal distribution of stochastic cracks and evaluating the process of fatigue damage according to the characteristics of short cracks' behavior in this paper. The model considered the influence of microstructure and the interaction of short cracks. Not only the statistic feature of short fatigue cracks but also those of single cracks can be obtained by using this model. Simulation results agreed well with those of experiments. Some features of short fatigue cracks were also obtained through the analysis of simulation results.

Keywords： sho rt fatig ue cr ack surface cra ck initiatio n and pr o pag atio n numerical simulatio n

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