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轴对称构件疲劳寿命预测的损伤力学—附加载荷—有限元法

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DAMAGE MECHANICS—ADDITIONAL LOAD—FINITE ELEMENT METHOD FOR FATIGUE LIFE PREDICTION OF AXISYMMETRICAL STRUCTURAL MEMBERS

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摘要 提出了一种实用有效的弹塑性损伤应力 -应变本构方程与损伤演化方程。针对中高周疲劳问题,发展了轴对称疲劳寿命预测的损伤力学 -附加载荷 -有限元法计算格式。通过引入塑性附加载荷,考虑了构件应力集中区域塑性变形对构件疲劳寿命的影响。预估了 3 0 Cr Mn Si Ni2 A材料含沟槽轴对称试件的疲劳裂纹形成寿命,并分析了疲劳裂纹的扩展情况。疲劳寿命理论预测结果与实验结果吻合良好

关键词： 损伤力学 有限元 疲劳 轴对称 附加载荷法

Abstract： The practical and effective expressions of stress strain constitutive relation and damage evolution for elastoplastic damage problems are proposed. For the intermediate and high cycle fatigue problems, a damage mechanics additional load finite element method is developed. By introducing the plastic additional loads, the influence of plasticity in the area of stress concentration on the fatigue life of the specimen is considered. The fatigue crack initiation lives for notched bar specimens of 30CrMnSiNi2A material, as well as the fatigue crack propagation, are calculated. The theoretical results by the present theory are in good agreement with the experimental results. It shows that the present method has important and practical values.

Keywords： damag e mechanics finit e element metho d fatig ue ax isymmetry a dditio nal loa d metho d

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