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论文

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3. 5%NaCl溶液和取向对铝合金2124T851疲劳裂纹扩展特性的影响

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INFLUENCE OF SEAWATER, STRESS RATIO AND FREQUENCY ON FATIGUE CRACK GROWTH BEHAVIOR IN ALLOY 2124T851

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摘要

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摘要 针对某型号飞机结构损伤容限设计的要求,对高强铝合金2124T851进行了不同环境与取向对疲劳裂纹扩展特性影响的试验研究。结果表明,3.5%NaCl溶液中的Cl加速了2124T851铝合金的疲劳裂纹扩展速率 da/dN 。断口电镜分析表明,分布密度较大的第二相质点使横向的 da/dN 高于纵向的 da/dN 。有效应力强度因子可以满意地表征不同取向及不同环境中的 da/dN 。裂纹面上的腐蚀产物较薄,对裂纹闭合的影响可以忽略不计,1~10Hz范围内的试验频率对3.5%NaCl溶液中的 da/dN 几乎没有什么影响。

关键词: 铝合金 腐蚀 疲劳寿命 裂纹扩展 裂纹闭合

Abstract: The corrosion fatigue crack growth properties in aluminum alloy 2124T851 in both L-T and T-L orientations were studied, primarily, in 3.5%NaCl solution and at frequencies of 1 and 10 Hz with stress ratios of 0.5, 0.06 and -1. The results show that the fatigue crack growth rate (FCGR) in 3.5%NaCl solution is higher than that in air. FCGR in TL orientation is slightly higher than that in L-T orientation, FCGR for all test conditions are well correlated with K_{eff} derived from equation based on crack closure theory proposed by Schijve. This implies that crack closure role is negligible by Auger spectroscopy because of the thinner corrosion product on the crack surface. Little effect of a test frequency between 1 Hz and 10 Hz on FCGR was observed a possible explanation is offered.

Keywords: aluminium alloys. corrosion fatigue life crack propagation crack closure

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