

论文

环境介质对40Cr结构钢高周和超高周疲劳行为的影响

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摘要:

选用40Cr结构钢, 分别在空气、水和3.5%NaCl水溶液中进行旋转弯曲疲劳实验, 研究环境介质对该结构钢高周和超高周疲劳特性的影响. 结果表明, 40Cr钢在水环境中的疲劳强度比在空气中明显降低; 在3.5%NaCl水溶液环境中的疲劳强度比在水中低. 断面观察显示, 在水和3.5%NaCl水溶液中, 疲劳裂纹多源萌生; 在稳态扩展阶段, 裂纹沿晶界扩展并存在广泛分布的沿晶二次裂纹. .

关键词: 40Cr结构钢 超高周疲劳 环境介质 疲劳强度 疲劳裂纹萌生

EFFECTS OF ENVIRONMENTAL MEDIA ON HIGH CYCLE AND VERY-HIGH-CYCLE FATIGUE BEHAVIORS OF STRUCTURAL STEEL 40Cr

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Abstract:

Very-high-cycle fatigue of metallic materials is commonly regarded as fatigue failure occurs at stress levels below conventional fatigue limit and the relevant fatigue lives are above 10⁷ cyc. Rotary bending fatigue tests for a structural steel 40Cr were performed in laboratory air, fresh water and 3.5%NaCl aqueous solution, respectively, to investigate the influence of environmental media on fatigue behaviors of the steel in high cycle and very-igh-cycle fatigue regimes. The results show that the fatigue strength of the steel in water is remarkably degraded compared with that in air, and the fatigue strength in 3.5% NaCl solution is even lower than that in water. The fracture surface observations show that for the specimens tested in water and 3.5%NaCl solution, multiple crack originations exist and cracks propagate along grain boundary with widespread secondary cracks in their steady propagation period.

Keywords: structural steel 40Cr very-high-cycle fatigue environmental media fatigue strength fatigue crack initiation

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