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研究报告

表面状态对690TT合金腐蚀及应力腐蚀行为的影响

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摘要: 采用扫描电镜、原子力显微镜和表面粗糙度测量仪对具有不同表面状态的690TT合金表面形貌进行了表征与比较。采用零电荷电位测量、动电位扫描和电化学缓慢扫描等方法对不同的690TT合金的腐蚀行为进行了比较。结果表明,与机械抛光样品相比较,打磨样品表面起伏较严重,拥有更大的表面粗糙度值;在相同的腐蚀环境中,打磨样品比机械抛光样品表现出更大的腐蚀速度和更高的应力腐蚀开裂敏感性。分析认为,单纯的表面较大粗糙度和残余应变均能够促进690TT合金的腐蚀。实验中打磨690TT样品表现出的较高腐蚀速度和应力腐蚀开裂敏感性是由其较大的表面粗糙度和表面残余应变 综合影响结果。

关键词: 690TT合金 表面状态 应力腐蚀 电化学

EFFECTS OF SURFACE CONDITION ON CORROSION AND STRESS CORROSION CRACKING OF ALLOY 690TT

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Abstract: The scanning electron microscopy (SEM), atomic force microscopy (AFM) and surface profilometry were employed to characterize the surface conditions of Alloy 690TT samples. The corrosion behaviors of Alloy 690TT samples with different surface conditions were compared by potential of zero charge (PZC), potentiodynamic polarization curves and electrochemical fast and slow scan. The experiment results showed that the surfaces ground to 400# were much rougher than the mechanically polished surfaces and surface roughness of the former was bigger than the latter. The corrosion rate of the ground surfaces was bigger and the ground surfaces were more sensitive to stress corrosion cracking (SCC), compared with the mechanically polished surfaces in the same corrosive environment. That corrosion of Alloy 690TT could be accelerated by single surface roughness or single surface residual strain. The difference of corrosion rate and the sensitivity of SCC in this experiment were affected by surface roughness and surface residual strain simultaneously.

Keywords: alloy 690TT surface condition stress corrosion cracking (SCC) electrochemistry

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