

论文

Fe—Cr合金在650℃共晶(Li,K)2CO3熔盐中的腐蚀电化学阻抗谱研究

曾潮流, 王文, 吴维tao

中国科学院金属腐蚀与防护研究所金属腐蚀与防护国家重点实验室

摘要:

应用电化学阻抗技术并结合物相分析技术研究了合金元素Cr对Fe在650℃(Li, K)2CO3共晶熔盐中的腐蚀行为的影响。结果表明, 加入5%和10%Cr不能改善Fe的耐腐蚀性能, 而加入20%和25%Cr则能显著提高其耐腐蚀性能; Fe及Fe—Cr合金腐蚀电化学阻抗谱呈双容抗弧特征, 合金腐蚀受荷电粒子在氧化膜中的迁移控制。提出将合金表面形成的氧化膜理想化为一电容器, 并建立了氧化物电容与双电层电容串联的等效电路来描述合金腐蚀的阻抗特征。此外, 根据所提供等效电路对合金腐蚀电化学阻抗谱进行了解析。

关键词: 燃料电池 Fe—Cr合金 熔盐腐蚀 电化学阻抗

CORROSION ELECTROCHEMICAL-IMPEDANCE OF Fe-Cr ALLOYS IN EUTECTIC (Li, K)2CO3 MIXTURE AT 650C

Abstract:

Electrochemical impedance as well as physical analysis techniques were employed to study the effect of Cr on the corrosion of pure iron in eutectic (Li,K)2CO3 mixture at 650C. The results indicated that the addition of 5% and 10%Cr to pure iron had little effect on its corrosion resistance, however the additives of 20% and 25% Cr could greatly improve the corrosion resistance of iron. The Nyquist plots for the corrosion of pure Fe and Fe-Cr alloys in the melt were composed of two capacitance loops, and the corrosion was controlled by the transportation of species in the scale. It was proposed that the oxide scale be idealized as a capacitor, thus, an equivalent circuit of a capacitor in series with double-layer capacitance was established to represent the impedance spectra for Fe and Fe-Cr alloys. Additionally, based on the equivalent circuit model, the impedance spectra were evaluated.

Keywords: Fe-Cr alloys eutectic (Li, K)2CO3 melt electrochemical impedance corrosion

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通讯作者: 曾潮流 Email:

作者简介:

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