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大气科学 **研究论文**

Cr合金在含Cl^-和SO_4^{2-}离子溶液中的腐蚀行为

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Corrosion Behavior of Fe-Cr Alloy in the Solution with Cl^- and SO_4^{2-}

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摘要 为研究Fe-Cr 合金在含Cl^-和SO_4^{2-} 离子溶液中浸泡的腐蚀行为，采用显微激光拉曼光谱技术进行腐蚀产物分析，并进行线性极化和交流阻抗电化学测试明确腐蚀机理。研究结果表明，Fe-Cr 合金含有大量Cr 更容易形成钝化膜，在浸泡初期Fe-Cr 合金腐蚀速度很小。随着浸泡时间增加，维钝电流密度呈现先增加而后明显减小的趋势，说明钝化膜不断加强，钝化膜起到较好的阻碍Cl^-和SO_4^{2-} 阴离子侵蚀作用。在酸性溶液中，Fe-Cr 合金钝化的同时也发生着点蚀，且随着浸泡时间的增长而加剧。Fe-Cr合金在浸泡150 h 后，在三角晶界及其附近的晶界更易出现腐蚀产物，这是由于模拟溶液中含有大量Cl^-离子，致使钝化膜破损。而在Fe-Cr 合金的腐蚀产物中出现CrOOH，对腐蚀有抑制作用。

关键词 ： Fe-Cr合金, 腐蚀行为, 线性极化, 交流阻抗

Abstract : The corrosion behaviors of Fe-Cr alloy in the acidic solutions with Cl^- and SO_4^{2-} are investigated. The corrosion mechanisms are characterized by the linear polarization and the electrochemical impedance spectroscopy measurements, and the corrosion products are analyzed by the laser Raman spectrometry. It is shown that the Fe-Cr alloy is attributed for the passive film, which is formed more easily when the alloy contains a large quantity of Cr element. In the early immersion, the corrosion rate of Fe-Cr alloy is very small. With the immersion time increases, the passive current density firstly increases, and then decreases. The passive film can well prevent the Cl^- and SO_4^{2-} anion erosions. For Fe-Cr alloy, pitting occurs in an acidic solution, and it increases its extent with the increase of the immersion time. If the Fe-Cr alloy is immersed in the solutions for 150 h, the corrosion products appear in the near grain boundary, and are more likely to occur in the triangle grain boundary. The corrosion products of the Fe-Cr alloy contain CrOOH.

Key words : Fe-Cr Alloy corrosion behavior linear polarization electrochemical impedance spectroscopy

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