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研究报告

微量稀土对HAI77-2铜合金组织及耐腐蚀性能的影响

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摘要:

采用光学显微镜和常规力学性能测试分析了微量稀土对HAI77-2铝黄铜组织和力学性能的影响,结合静态腐蚀实验研究了添加稀土后合金耐腐蚀性能的变化,并利用扫描电镜、能谱分析和XRD等方法对腐蚀产物层进行了分析。结果表明:添加适量稀土可以使铝黄铜晶粒细化,强度提高,但塑性有所下降;在3.5%NaCl溶液中,含稀土铝黄铜比不含稀土的铝黄铜耐蚀性能好,表面形成一层致密且与基体结合牢固的腐蚀产物层,其主要成分:内层为 Al_2O_3 和稀土氧化物,外层为Cu、Zn的碱式氯化物和氯化物;而在3.5%NaCl+0.05% S^{2-} 溶液中,添加稀土虽能改善腐蚀产物层结构,但膜层已被 Cu_2S 严重脆化,合金耐腐蚀性能反而略有下降。

关键词: 稀土 HAI77-2合金 组织 耐腐蚀性能

INFLUENCE OF TRACE RARE EARTH ELEMENTS ON MICROSTRUCTURE AND CORROSION RESISTANCE OF HAI77-2 COPPER ALLOY

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Abstract:

Effects of trace rare earth (RE) elements on microstructure and mechanical properties of HAI77-2 Al-brass were analyzed by OM and conventional mechanical test. Static corrosion experiment was used to study the corrosion behavior of the Al-brass after adding RE addition and SEM, energy analysis and XRD were simultaneously used to investigate the corrosion product layer synthetically. It was demonstrated that adding RE to Al-brass could refine grain and increase strength, but decrease the elongation; The corrosion resistance of the RE-containing Al-brass was better than that of Al-brass without RE in NaCl (3.5 mass%) solution. The consequence of such good corrosion resistance was attributed to the formation of compact protective film on alloy surface which contained RE elements. The RE-contained film, which was composed of an inner Al_2O_3 , RE oxide and an outer chloride or basic chloride of Cu, Zn, combined with the matrix firmly and was difficult to fall off from the alloy surface. While the addition of RE could not improve the corrosion resistance of Al-brass. in NaCl (3.5 mass%) + S^{2-} solution. Although the corrosion products layer was ameliorated due to the RE addition, the corrosion resistance of the alloy deteriorated yet owing to the severe embrittlement of the corrosion product layer caused by Cu_2S .

Keywords: rare earth HAI77-2 alloy microstructure corrosion resistance

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