中国有色金属学报
中国有色金属学报(英文版)
中国科学技术协会 主管
中国有色金属学会 主办

论文摘要

中国有色金属学报
ZHONGGUO YOUSEJINSHUXUEBAO XUEBAO
第20卷 第1期 (总第130期) 2010年1月

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文章编号：1004-0609(2010)01-0156-07

Fe基非晶合金的晶化及其在NaCl溶液中的电化学腐蚀行为

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摘 要： 采用单辊甩带法制备出完全非晶态的$Fe_{78}Si_{13}B_9$和$Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$薄带，并利用非晶晶化退火法制备非晶和纳米晶双相合金$Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$薄带。利用X射线衍射仪和示差扫描量热计对该非晶薄带的非晶特性及其晶化过程进行研究，并用电化学极化曲线的方法和电化学阻抗技术对比研究非晶$Fe_{78}Si_{13}B_9$和双相合金$Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$在1 mol/L NaCl溶液里的电化学腐蚀行为，用SEM对极化测试后的试样形貌进行观察；同时还研究不同的热处理温度对材料的结构及在1 mol/L NaCl溶液里耐腐蚀性能的影响。结果表明：该非晶薄带的晶化过程分为两步；双相合金比非晶合金的耐腐蚀性要好；随着热处理温度升高，非晶合金和双相合金的耐腐蚀性能都得到提高。

关键字： 非晶合金；双相合金；晶化行为；耐腐蚀性能；扩散通道

Crystallization and electrochemical corrosion behaviors of amorphous Fe-based alloys in NaCl solution

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Abstract: Amorphous ribbons of $Fe_{78}Si_{13}B_9$ and $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ were prepared by the single-roller melt-spinning process, and the ribbons of amorphous and nano-crystalline two-phase $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ alloys were obtained by annealing. The amorphous ribbons and their crystallization processes were identified by differential scanning calorimeter and X-ray diffraction. A comparative study of the electrochemical corrosion behaviors of amorphous $Fe_{78}Si_{13}B_9$ and two-phase $Fe_{73.5}Si_{13.5}B_9Nb_3Cu_1$ alloys was performed by the linear polarization method and electrochemical impedance spectroscopy (EIS) in 1 mol/L NaCl solution. The morphologies of the samples after potentiodynamic polarization were observed by SEM. The influence of heat treatment at different temperatures on the alloy structure and corrosion resistance in 1mol/L NaCl solutions was investigated. The results show that the crystallization process of the amorphous ribbons can be divided into two

steps, and the two-phase alloy has a higher corrosion resistance than the amorphous alloy. The corrosion resistances of the amorphous and two-phase alloys increase as the thermal treatment temperature rises.

Key words: amorphous alloy; two-phase alloy; crystallization behavior; corrosion resistance; diffusion path