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论文

碳和钇对Fe-Cr-Al合金500℃时效脆化的影响

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摘要： 测定了Ｆｅ－１５Ｃｒ－４Ａｌ合金在５００℃的时效脆化动力学，利用内耗，ＴＥＭ，ＥＰＭＡ和ＳＥＭ等手段研究了合金在时效后的组织变化和断裂行为．结果表明，时效脆化第一阶段（０－１００ｈ）主要是碳化物在α相晶界析出的作用，它损害界面结合，降低断裂应力，使塑性在时效０．２５ｈ后消失；第二阶段（１００－１０００ｈ）主要是富Ｃｒ－α′相均匀析出的作用，它通过强化基体引起二次脆化．含０．２和０．４％Ｙ的Ｆｅ－１５Ｃｒ－４Ａｌ－Ｙ合金在固溶态下无Ｓｎｏｅｋ内耗峰，碳在α相中的浓度低于０．０００７％，这是碳原子被Ｙ_２Ｆｅ_（１７）相俘获的结果．因此，含钇合金在５００℃时效时不发生晶界碳化物析出，时效１０００ｈ后塑性无明显变化．

关键词： Ｆｅ－Ｃｒ－Ａｌ合金 时效脆化 碳 钇

EFFECTS OF CARBON AND YTTRIUM ON 500℃ AGING EMBRITTLEMENT OF ALLOY Fe-15Cr-4Al

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Abstract: The embrittlement kinetics of alloy Fe-15Cr-4Al during aging at 500℃ was determined and the changes in microstructure and fracture behavior after aging were investigated by internal friction, TEM, EPMA and SEM. It was found that the aging embrittlement consisted of two stages. In the first stages (0-100 h), the rapid precipitation of carbide around grain boundaries of α-phase played an important role. In the second stage (100-1000 h), the action of Cr rich α'-phase precipitated uinformly in α-phase became more important. For alloys Fe-15Cr-4Al-Y with 0.2 and 0.4% Y, the EPMA results indicated that the carbon atoms were captured by Y_2Fe_(17) phase in these alloys, and no any carbide precipitation could be detected in the aged alloys by TEM, which is the reason why the Fe-Cr-Al-Y alloys have high plasticity during aging at 500℃ for 1000 h.

Keywords: Fe-Cr-Al alloy aging embrittlement carbon yttrium

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