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17卷 第11期 (总第104期) 2007年11月

[PDF全文下载]

文章编号：1004-0609(2007)11-1849-06

原位合成Al2O3颗粒增强双相TiAl基复合材料的组织与性能

艾桃桃1，王 芬2，冯小明1，郭从盛1

(1. 陕西理工学院 材料科学与工程学院，汉中 723003；2. 陕西科技大学 材料科学与工程学院，西安 710021)

摘 要：以Ti-Al-TiO_2反应体系为基础，添加不同含量的Nb_2O_5粉，采用压力协助原位合成Al_2O_3颗粒增强的双相TiAl基复合材料，对复合材料的组织和力学性能进行了分析讨论，并探讨了其增韧机制。结果表明：Nb_2O_5的掺杂使复合材料的相对密度和硬度得到提高，抗弯强度和断裂韧性在Nb_2O_5掺杂量为6%(质量分数)时达到最大，分别为398.38 MPa和6.992 MPa·$m^{1/2}$。微观组织分析表明，获得了双相组织，Al_2O_3颗粒分布于基体晶界处；随Nb_2O_5的掺杂量增大，Al_2O_3颗粒呈细小弥散分布，同时基体晶粒尺寸也减小。双相基体晶粒的细化及Al_2O_3颗粒的弥散分布是赋予材料高韧性的主要增韧机制。

关键字： 双相TiAl合金；Al2O3；原位反应；组织结构；力学性能；增韧机制

Microstructure and mechanical properties of in situ Al2O3 particles reinforced two-phase TiAl-based composites

AI Tao-tao1, WANG Fen2, FENG Xiao-ming1, GUO Cong-sheng1

（1. Department of Materials Science and Engineering, Shaanxi University of Technology,Hanzhong 723003, China;2. School of Materials Science and Engineering,Shaanxi University of Science and Technology, Xi'an 710021, China ）

Abstract: Abstract: In situ Al2O3 particles reinforced two-phase TiAl-based composites were prepared by pressure-assisted high-temperature reaction sintering of Ti-Al-TiO2-Nb2O5 system. The microstructure and mechanical properties of the composites were investigated. The toughening mechanism was also analysed. The results show that the relative density and Rockwell hardness of the composites increase with increasing Nb2O5 content. When the Nb2O5 content is 6% (mass fraction), there presents a better bending strength and fracture toughness, and the bending strength attains 398.38 MPa, moreover, the fracture toughness reaches 6.992 MPa·m1/2. The analysis of the microstructures reveals that it obtains a submicron α2/γ dual phase structure, and the Al2O3 particles distribute on the grain boundary. The in situ Al2O3 particles are dispersively distributed and the grains are refined with increasing Nb2O5 content. Two-phase TiAl grain refining and Al2O3 particles dispersive distribution are the main toughening mechanisms.

Key words: two-phase TiAl alloy; Al2O3; in situ reaction; microstructure; mechanical property; toughening mechanism

地 址：湖南省长沙市岳麓山中南大学内 邮编： 410083

电 话： 0731-8876765，8877197，8830410 传真： 0731-8877197

电子邮箱： f-ysxb@mail.csu.edu.cn