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$(\text{Al}_2\text{O}_3+\text{TiB}_2)/\text{ZL202}$ 复合材料的制备和力学性能

赵德刚¹, 刘相法¹, 边秀房¹, 刘相俊¹, 张永昌²

(1. 山东大学 材料液态结构及其遗传性教育部重点实验室, 济南 250061;
2. 临沂恒源热电有限公司, 临沂 276000)

摘 要: 采用原位熔体反应合成法制备了 $(\text{Al}_2\text{O}_3+\text{TiB}_2)/\text{ZL202}$ 复合材料。用电子探针对该复合材料的微观组织进行观察。结果表明: 增强相 TiB_2 颗粒主要分布于晶界上, 与 CuAl_2 相交织在一起, 尺寸在 $1\mu\text{m}$ 左右, 呈现圆球形, Al_2O_3 颗粒约在 $3\mu\text{m}$ 左右, 呈现规则的颗粒或圆球状, 且彼此分离, 界面干净。对铸态复合材料室温抗拉强度和硬度的测试发现, 两相颗粒增强的复合材料都较单一颗粒增强复合材料要高。经过T6处理后, $(\text{Al}_2\text{O}_3+\text{TiB}_2)/\text{ZL202}$ 复合材料的抗拉强度由221.0 MPa提高至339.6 MPa, 提高幅度达53.67%, 其延伸率降低至2.60%。

关键字: 原位合成; 金属基复合材料; 力学性能; TiB_2 ; Al_2O_3 ; 颗粒

Fabrication and mechanical properties of $(\text{Al}_2\text{O}_3+\text{TiB}_2)/\text{ZL202}$ composites

ZHAO De-gang¹, LIU Xiang-fa¹, BIAN Xiu-fang¹,
LIU Xiang-jun¹, ZHANG Yong-chang²

(1. The Key Laboratory of Materials Liquid Structure and Heredity,
Ministry of Education, Shandong University,
Jinan 250061, China;
2. Linyi Hengyuan Thermoelectricity Co. LTD, Linyi 276000, China)

Abstract: Fabrication technology of $(\text{Al}_2\text{O}_3+\text{TiB}_2)/\text{ZL202}$ composites by in-situ reaction synthesis process was fabricated. The electron probe microanalyses of the composites reveal that TiB_2 particles distribute along the grain boundaries, which interweave with CuAl_2 phases. TiB_2 particle is about $1\mu\text{m}$ in size, with nearly spherical form. Al_2O_3 particles are about $3\mu\text{m}$ in size, which are separated and its interfaces are clean. From the results of hardness tests and tensile experiments at room temperature, it is found that the hardness of the composites reinforced cooperatively by both TiB_2 and Al_2O_3 is obviously

higher than that of composites reinforced by one kind of particle. After T6 treatment, the tensile strength of (Al₂O₃+TiB₂)/ZL202 composite increases from 221.0 MPa to 339.6 MPa, which is raised by 53.67%. The ductility of composites is 2.60%.

Key words: in-situ reaction; metal matrix composites; mechanical properties; TiB₂; Al₂O₃; particles

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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-yxcb@mail.csu.edu.cn