



论文摘要

中国有色金属学报

ZHONGGUO YOUSEJINSHUXUEBAO XUEBAO

第14卷 第2期 (总第59期) 2004年2月

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文章编号: 1004-0609(2004)02-0228-05

反应热压($\text{Al}_2\text{O}_3+\text{TiB}_2+\text{Al}_3\text{Ti}$)/Al复合材料的组织形成机制王桂松¹, 耿林¹, 王德尊¹, 张世振²(1. 哈尔滨工业大学 材料科学与工程学院, 哈尔滨 150001;
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摘要: 采用B或 B_2O_3 、 TiO_2 和Al粉反应热压制备了原位($\text{Al}_2\text{O}_3+\text{TiB}_2+\text{Al}_3\text{Ti}$)/Al复合材料, 采用光学显微镜、扫描电镜和透射电镜分析了原位复合材料的显微组织。热压状态下, 反应生成相 Al_3Ti 呈大块不规则形状, 尺寸约几十微米; Al_2O_3 和 TiB_2 为细小弥散质点, TEM分析发现 TiB_2 颗粒呈六边形, 而 Al_2O_3 颗粒呈等轴状。在以Al粉、 TiO_2 粉和B粉为原料制备的复合材料中, 除反应生成了大块的 Al_3Ti 相外, 还有细小针状 Al_3Ti 相沉淀析出, 且呈弥散分布。热挤压后大块的 Al_3Ti 被破碎成细小弥散质点。 Al_2O_3 在 TiO_2 和 B_2O_3 粉末表面生成; TiB_2 在B或 B_2O_3 粉表面形成, 因而均呈弥散分布, 且尺寸细小。自 TiO_2 中还原出的Ti溶入液态Al中形成 Al_3Ti 时, Ti可在液态Al中长距离扩散, 因而 Al_3Ti 呈大块不规则状。

关键词: 反应热压; Al基复合材料; Al_2O_3 ; TiB_2 ; Al_3Ti ; 显微组织Microstructure formation mechanism of ($\text{Al}_2\text{O}_3+\text{TiB}_2+\text{Al}_3\text{Ti}$)/Al composites fabricated by reaction hot pressingWANG Gui-song¹, GENG Lin¹, WANG De-zun¹, Tjong Sie-chin²(1. School of Materials Science and Engineering,
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Abstract: Two ($\text{Al}_2\text{O}_3+\text{TiB}_2+\text{Al}_3\text{Ti}$)/Al composites were made from Al- B_2O_3 - TiO_2 and Al-B- TiO_2 raw powders by hot pressing. The microstructure of the two composites was analyzed by OM, SEM and TEM. The results show that coarse Al_3Ti blocks with size of several tens of micrometers are formed during hot pressing, and the fine equiaxed Al_2O_3 and hexagon TiB_2 particulates are formed simultaneously. On the other hand, there are fine Al_3Ti precipitates in the composite fabricated from Al, B and TiO_2 powders. After extrusion, the coarse Al_3Ti blocks are broken into small pieces. Al_2O_3 particles are formed on the surface of TiO_2 or B_2O_3 powder, TiB_2 particles are formed on B or B_2O_3 powders, and they are fine and dispersively distributed. The formation of coarse Al_3Ti block is resulted from long-distance diffusion of Ti in liquid Al.

Key words: hot pressing; Al matrix composite; Al_2O_3 ; TiB_2 ; Al_3Ti ; microstructure

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