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## 原位 $\text{Al}_2\text{O}_3$ 和 $\text{TiB}_2$ 粒子增强Al-Cu合金基复合材料的制备和性能

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**摘要:** 由  $\text{TiO}_2$ -Al-B-CuO 体系制备了原位 $\text{Al}_2\text{O}_3$ 和 $\text{TiB}_2$ 粒子增强Al-3.2%Cu和Al-6.0%Cu合金基复合材料。X射线衍射分析表明, 在两种复合材料中均有 $\text{Al}_2\text{O}_3$ 和 $\text{TiB}_2$ 生成, 没有发现 $\text{Al}_3\text{Ti}$ 相产生。原位生成的 $\text{Al}_2\text{O}_3$ 和 $\text{TiB}_2$ 粒子为尺寸小于 $2\mu\text{m}$ 的等轴状粒子, 在Al基体中均匀分布。室温拉伸试验表明两种Al-Cu合金基原位复合材料具有很高的强度, 并且随着基体合金中Cu含量的增加复合材料的强度增加。动态压缩试验表明, 这种Al-Cu合金基原位复合材料的强度对应变速率是不敏感的, 这可由不同应变速率变形后的复合材料基体中位错密度大致相同来解释。高温压缩蠕变试验表明, 两种复合材料均表现出高的显态应力指数。随基体合金中Cu含量的增加复合材料的蠕变抗力明显提高。

**关键字:** 复合材料 原位 陶瓷粒子  $\text{Al}_2\text{O}_3$   $\text{TiB}_2$

## ABRICATION AND PROPERTIES OF IN-SITU $\text{Al}_2\text{O}_3$ AND $\text{TiB}_2$ PARTICLES REINFORCED Al-Cu ALLOY COMPOSITES

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**Abstract:** In-situ  $\text{Al}_2\text{O}_3$  and  $\text{TiB}_2$  particles reinforced Al-3.2% Cu and Al-6.0%Cu alloy composites were fabricated from  $\text{TiO}_2$ -Al-B-CuO system. X-ray diffraction analyses indicate that  $\text{Al}_2\text{O}_3$  and  $\text{TiB}_2$  are formed in two composites and no  $\text{Al}_3\text{Ti}$  appears, insitu formed  $\text{Al}_2\text{O}_3$  and  $\text{TiB}_2$  particles with a size of less than  $2\mu\text{m}$  are equiaxed and well-distributed in Al matrix. Tensile tests at room temperature indicate that two Al-Cu alloy matrix composites exhibit high strength, which increases with increasing Cu content of matrix alloy. Dynamic compression tests demonstrate that the strength of the Al-Cu alloy matrix composites is insensitive to the strain rates, which can be explained by approximately identical dislocation density in the

matrix of the composites deformed at different strain rates. Compressive creep tests at high temperature show that both composites exhibit high apparent stress exponents and the creep resistance of the composites is obviously increased with increasing Cu content of the matrix alloy.

**Key words:** composites in-situ ceramic particle  $\text{Al}_2\text{O}_3$   $\text{TiB}_2$

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