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Mg对原位合成TiB₂/Al-7Si复合材料的 微观组织及力学性能的影响

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摘要: 采用K₂TiF₆和KBF₄混合盐原位反应法制备TiB₂/Al-7Si复合材料, 利用XRD、SEM、金相显微镜、HV硬度测试和磨损实验等方法研究了Mg对复合材料的微观组织和力学性能的影响。结果表明: 反应生成的TiB₂颗粒平均尺寸约为0.5 μm, 材料的硬度和耐磨性随着TiB₂含量的增加而提高; 添加1.5%Mg(质量分数)元素可明显细化TiB₂颗粒, 且使其分布更加均匀, 增强TiB₂颗粒的弥散强化和细晶强化效果, 复合材料的硬度和耐磨性显著改善; 过量的Mg元素(3%)会造成TiB₂颗粒细化效果的下降, 但其硬度和耐磨性能继续得到改善。

关键字: TiB₂/Al-7Si复合材料; Mg; 微观组织; 硬度; 力学性能

Effect of Mg on microstructures and mechanical properties of in-situ TiB₂/Al-7Si composite

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Abstract: In-situ TiB₂/Al-7Si composites were fabricated by K₂TiF₆ and KBF₄ compounds reaction in Al-7Si melt. The effect of Mg on the microstructures and mechanical properties of TiB₂/Al-7Si were investigated by using XRD, SEM, optical microscopy, hardness and wear testing techniques. The results show that TiB₂ particles with average size of about 0.5 μm are produced. The hardness and wear resistance increase with increasing TiB₂ content. Adding about 1.5%Mg in melt restrains

the conglomeration of the TiB_2 particles, which makes the size of TiB_2 particle decrease and the distribution of TiB_2 particle is more homogeneous. The strengthening effect of TiB_2 particles is enhanced and the hardness and wear resistance of composites are obviously improved. The excess Mg decreases the refinement effect of TiB_2 particles, but the hardness and wear resistance are improved continuously.

Key words: $TiB_2/Al-7Si$ composites; Mg; microstructure; hardness; mechanical properties

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