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搅拌摩擦加工技术制备Ti颗粒增强 AZ31镁基复合材料

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摘要: 利用搅拌摩擦加工技术制备Ti颗粒含量为20%(体积分数,下同)与40%的Mg-AZ31基复合材料。结果表明:碎化后的Ti颗粒平均尺寸约为200 nm,经4次搅拌摩擦加工处理后基体组织发生明显的细化,晶粒尺寸为3-5 μm。添加20% Ti颗粒的复合层中碎化的Ti颗粒在Mg基体中呈不均匀分布,复合层具有较低的强度和伸长率;当Ti颗粒添加量为40%时,复合层中碎化Ti颗粒在Mg基体中均匀分布,复合层强度有明显提高,伸长率较基体无明显降低。利用混合定律计算复合层的显微硬度,其结果与试验值相吻合。

关键字: 镁合金; 复合材料; 搅拌摩擦加工; Ti颗粒

Preparation of Mg-AZ31 based composites with Ti particles by friction stir processing

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Abstract: Mg-AZ31 based composites with 20% (volume fraction) and 40% Ti particles were fabricated by friction stir processing (FSP). The results show that after four FSP passes the matrix structure of composite layers can be significantly refined within 3-5 μm obviously, and the fragments of the Ti particles are about 200 nm. The Ti fragments in the composite layer with 20% Ti particles have inhomogenous distribution and demonstrate poor tensile properties and low elongation. However, the Ti fragments in the composite layer with 40% Ti particles have homogenous distribution and the tensile properties of composite layer are greatly improved, and the elongation of composite layer has no obvious change compared with that of matrix. Using the rule of mixture to predict the microhardness values of composite layers, the results

approximately match the experimental ones.

Key words: magnesium alloy; composites; friction stir processing (FSP); Ti particles

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