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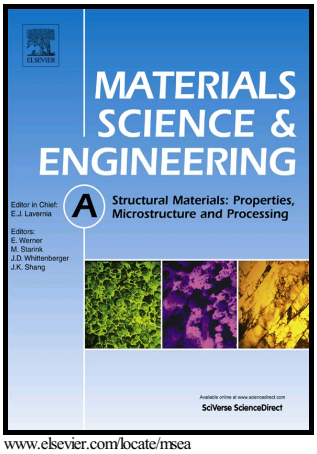

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Microstructure and mechanical properties of stir cast ZX51/Al_2O_3p magnesium matrix composites

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Abstract

Magnesium matrix composites can overcome the limitations of magnesium and its alloys. This paper investigates the effect of adding Al_2O_3 microparticles on microstructure and mechanical response of ZX51 alloy-matrix composites. Stir casting process was chosen due largely to its low cost to fabricate the novel ZX51/Al_2O_3p composites. Scanning electron microscopy, energy dispersive spectroscopy, and X-ray diffractometry were used in order to analyze the microstructure of as-cast composites. Tension, compression, and Brinell hardness tests were performed to determine mechanical properties of the composites. It was revealed that the microstructure of matrix alloy is composed of α-Mg grains and (α-Mg + $Ca_2Mg_6Zn_3$) eutectic mixture distributed predominantly along grain boundaries. The addition of Al_2O_3p brought about a marked grain refinement and also introduced slight amounts of porosity. The results showed that with increasing volume percentage of Al_2O_3p, hardness and yield strength increase while tensile strength, compressive strength, and ductility decrease; in consequence, toughness decreases as well.