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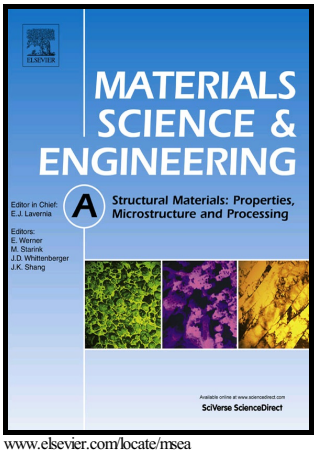

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Abstract

High strength and toughness carbon nanotubes (CNTs) reinforced Mg-6Zn composites were fabricated by stirring casting integrated with friction stir processing (FSP). The strengthening mechanisms of the CNTs/Mg-6Zn composites were expounded by the characterization of the microstructural evolution and the mechanical properties. The singly dispersed CNTs formed compact bonding with the matrix, which contributed to the grain refinement and the mechanical properties enhancement of the Mg-6Zn matrix. The strengthening contributions are based on the grain refinement, load transfer and Orowan looping mechanisms. The yield strength, ultimate tensile strength, elongation of the FSPed CNTs/Mg-6Zn composites reached 171 MPa, 330 MPa and 15%, which were 144%, 156% and 87% higher than those of the as-cast pristine Mg-6Zn alloy. The fabrication route is proved to be effective to develop innovative CNTs-reinforced metal matrix composites with exceptional mechanical properties.

Key word:

Mg matrix composites; Carbon nanotubes; Friction stir processing; Strengthening mechanisms; Mechanical properties