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Simulation for carbon nanotube dispersion and microstructure formation in CNTs/Mg composite fabricated with ultrasonic processing

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ABSTRACT

Carbon nanotube reinforced Mg-based composite with ultrasonic processing is studied, which is focused on the dispersion of carbon nanotubes and formation of microstructure with physical and numerical simulations. Ultrasonic acoustic streaming and ultrasonic acoustic cavitation during the processing are calculated and simulated with the finite element method. The relationship between sound pressure amplitude and the ultrasonic cavitation in the melt is established based on the simulation results. Dispersion of carbon nanotubes in alloy melt is physically simulated with glycerin as solution under the action of ultrasonic acoustic cavitation and ultrasonic acoustic streaming, which shows the carbon nanotubes are dispersed well by ultrasonic processing. The microstructure of the CNTs/Mg composite is simulated by the CAFD method. Due to the uniform dispersion of the carbon nanotubes, the nucleation rate of the matrix alloy is increased and the growth of dendrites is changed.

KEYWORDS: ultrasonic processing, carbon nanotube, composite, simulation