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The effects of SiC particles size on the microstructural and mechanical properties of Al6063 matrix composites

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Abstract

This research discusses the microstructural and mechanical properties of bimodal Al6063 composites consisting of an ultrafine-grained (UFG) matrix which are reinforced by SiC particles. In order to synthesize the composites, high-energy mechanical alloying method followed by a hot extrusion step was used. SiC particles with micro and nano dimensions were utilized to reinforce aluminum matrix. Optical micrograph (OM), Scanning electron microscopy (SEM) and Energy-dispersive X-ray spectroscopy (EDS) were performed to investigate the produced powders properties. SEM analysis showed a uniform reinforcement particles distribution in the aluminum matrix. The results of tension and compression tests indicated that adding micro-sized SiC particles to the aluminum matrix causes a significant rise (about 20%) in its tensile strength and addition of nano-sized SiC particles increases the tensile strength more than micro-sized particles (about 27%). The simultaneously presence of micro and nano-sized particles in the aluminium matrix as a bimodal composite increases the tensile strength (about 37%).

Keywords: mechanical properties; reinforcement particles; bimodal composites.