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Development and Mechanical Characterisation of Al6061-Al2O3-Graphene Hybrid Metal Matrix Composites

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Abstract

MMC based on aluminium (Al) were produced for light-weight applications especially in aviation and automobile areas. Present paper deals with the fabrication and mechanical performance of AA6061 matrix composites fortified with Al_2O_3 (alumina) and graphene particulates. Fluid metallurgy method namely stir casting route was employed for fabricating the hybrid composites. Al_2O_{3p} and graphene powder are mixed in different weight fractions in which graphene (1 wt. %) particle reinforcement is held consistent and Al_2O_3 reinforcement is differed freely with 5, 10 and 15 wt. %. Using optical analyser and SEM equipment, microstructural examination is carried out and the result reveals that the graphene and Al_2O_3 particles prevalently are homogeneously appropriated on the grain limits of Al matrix and Al_2O_3 particles are disseminated between graphene in the as-cast AA6061 MMC's. Detailed analysis on investigation of the microstructure and mechanical aspects of Al6061-graphene-Al_2O_{3p} composites is presented by following ASTM guidelines; results uncovered that with increment in reinforcement particles, there is an enhancement in the hardness, ultimate strength, yield strength and a decline in the elongation values was however noticed when contrasted with Al6061 alloy. Fractography investigation revealed dimples in unreinforced alloy and the composite.

Keywords:

Metal matrix composites; Al_2O_3; graphene; mechanical properties; fractography.