

Mechanical Behaviour of Cold Deformed and Solution Heat-treated Alumina Reinforced AA 6063 Metal Matrix Composites

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Abstract: *The mechanical behaviour of cold deformed and solution heat-treated aluminium alloy (6063)- alumina particulate composites was investigated. AA 6063- Al_2O_3 particulate composites having 6, 9, and 12 volume percent of Al_2O_3 were produced using two-step stir casting process. The composites were cold rolled to 20 and 35% deformation before solution heat-treating at 550°C for 1hour cooling rapidly in water. Density measurements were used as a basis of evaluating the percent porosity of the composites; while tensile properties and fracture toughness were utilised to study the mechanical behaviour. It was discovered that the cold rolling and solution heat-treating processes resulted in remarkable reduction in porosity levels in the AA 6063/ Al_2O_{3p} composites (≤ 2.8 % porosity). A good uniform distribution of the alumina particulates in the matrix of the AA 6063 was also produced. The tensile strength and yield strength increased with increase in alumina volume percent and degree of cold rolling. The strain to fracture and fracture toughness decreased with increasing volume percent alumina but improved with increase in the degree of cold deformation.*

Keywords: *stir casting; AA 6063- Al_2O_3 ; cold rolling; mechanical behaviour; porosity; solution heat-treatment*