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A Study on Particle Weight Fraction and Extrusion on the Mechanical Properties and Microstructural Evaluation of Al-Cu/Fly Ash Composite.

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Abstract

Fly ash is the waste product coming out from thermal power plant is an increasingly urgent problem due to its storage and disposal. At the same time Metal Matrix composites (MMCs) reinforced with ceramic particles such as SiC, Al_2O_3 and B_4C has their partial use in engineering application due to higher cost. The study focuses on the Al-Cu alloy reinforced fly ash particles produced by stir casting followed by hot extrusion. The composites produced by incorporation of fly ash reinforcements by varying 2%, 4%, 6%, 8% and 10wt% is hot extruded with an extrusion temperature of 400°C, extrusion rate of 5mm/s and extrusion ratio of 1.77:1. The extrusion composites have been evaluated based on the investigation of mechanical properties and microstructure. The results showed that, the amount of porosity increased with increasing the percentage of fly ash reinforcements in stir cast and the extruded composites is almost gratis from porosity. Hardness and tensile strength of composites increases with increases in percentage of reinforcement by stir and extruded composites. But extruded composites show better mechanical properties than stir cast composites. Wear test under different loads and for 45 minutes duration have been conducted on both cast and extruded composites. The worn surfaces have been observed under Scanning electron microscope (SEM) to understand the mechanism of wear. Extruded composites possess lower wear rates under all studied loads with constant sliding velocities when compared with cast composites. Microstructural study using SEM shows that the fly ash particulates in the molten matrix forms strong matrix reinforcement interface and their distribution might have led to the increase in mechanical properties of the composites due to fine grain structure during extrusion and dislocation density in the matrix.

Keywords:

Stir Casting, fly ash, extrusion, mechanical properties.

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