

Comparative Studies on Mechanical Properties of Aluminium Based Hybrid Composites Cast by Liquid Melt Technique and P/M Route

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ABSTRACT

Metal matrix composites are a broad family of materials aimed at achieving an enhanced combination of properties. While the matrix can be any metal or alloy, most interest has been shown in the lighter structural metal cases, improvement in mechanical properties being the primary objective. Much of the progress in the field of metal matrix composites [1] is closely linked to developments in reinforcements for incorporation in metal matrix composites. However the orientation of this research is towards the fabrication and testing of aluminum-E-Glass-SiC composites [2], Cast by liquid melt technique and P/M route. The composites were prepared by liquid melt metallurgy technique through the process of vortex method. In liquid metallurgy technique E-glass / SiC reinforced aluminum composites of AL+2% SiC + 0% E-Glass, AL+4%SiC+2%E-Glass, AL+6%SiC+4%E-Glass, AL+8%SiC+6%E-Glass by weight were prepared and their Mechanical properties were evaluated. In Powder Metallurgy technique, vacuum hot press was used for compaction of the reinforced Aluminum powder (AL + SiC + E-Glass). Pressure of 50 mpa was applied at a constant rate. Sintering was done at a temperature of around 475⁰ C. E-Glass/SiC reinforced Aluminium composites of Al + 0% SiC+40%E-Glass, Al +10% SiC+30%E-Glass, Al +20% SiC+20%E-Glass, Al + 30% SiC+10%E-Glass by weight were prepared in the designed die and later they were machined using carbide tip tool to required sizes. The composites thus prepared were evaluated to characterize their Mechanical properties. The tensile tests were conducted in a 2-Ton Tensometer. The compression tests were conducted in a 40- Ton Universal Testing Machine. The hardness tests were conducted in the suitable Hardness Testing Apparatus by choosing appropriate scales of loading and measurement. The test revealed a marked increase in the tensile and compressive strengths and an appreciable increase in the hardness with respect to the base composites as well as Aluminium. Further on comparison, results of Liquid Melt Technique and P/M route the mechanical properties exhibited by the powder metallurgy route are larger than those obtained by the Liquid Melt Technique. The main reason for this behavior is the fact that the P/M route produces less porosity than the Liquid Melt Technique. Secondly the distribution of the reinforcement i.e. E-glass and SiC particles are more uniform in the P/M route as compared to the cast route.

Keywords: Hybrid Composites, aluminium alloys, SiC particulates, short glass fibre