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Synthesis, Structural Characterization, Mechanical and Wear behaviour of Cu-TiO_2-Gr Hybrid Composite through Stir Casting Technique

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Abstract

Manufacturing copper metal matrix composite (CMMCs) through stir casting method results in numerous desirable benefits. This research is dedicated on fabricating Cu with 0, 3, 6 and 9 wt% TiO_2 and 1% Gr CMMCs. The reinforcement particles were added to Cu molten metal at 1200°C. The cast CMMCs have been analysed using advanced characterization method viz. XRD, FESEM and EDAX. XRD peaks confirm the presence of hard ceramic TiO_2 particles in the matrix. Grain refinement takes place in the composite due to TiO_2 particles. Two kinds of distribution are observed in the micrographs. By increasing the content of TiO_2 and Gr, agglomeration occurs within the grain boundaries and reduces the grain size. As a result, hardness and ultimate tensile strength are improved by the incorporation of TiO_2 particles and the corresponding strengthening mechanisms involved have been discussed.

Keywords: Copper, TiO_2, metal matrix composite, stir casting, mechanical properties, wear, FESEM, EBSD, TEM.