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G. Nageswaran, S. Natarajan, K.R. Ramkumar



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Synthesis, Structural Characterization, Mechanical and Wear behaviour of Cu-TiO₂-Gr Hybrid Composite through Stir Casting Technique

G. Nageswaran, S. Natarajan, K.R. Ramkumar

Centre of Excellence in Corrosion and Surface Engineering, National Institute of Technology, Tiruchirappalli, Tamil Nadu, India.

Email: profsn68@gmail.com, mobile: +91 94860 01136.

First author's contact: email: nageswaran.gopalan@gmail.com,

Third author's contact: email: get2raam@gmail.com.

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% TiO₂ 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 TiO₂ particles in the matrix. Grain refinement takes place in the composite due to TiO₂ particles. Two kinds of distribution are observed in the micrographs. By increasing the content of TiO₂ 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 TiO₂ particles and the corresponding strengthening mechanisms involved have been discussed.

Keywords: Copper, TiO₂, metal matrix composite, stir casting, mechanical properties, wear, FESEM, EBSD, TEM.

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