

عنوان مقاله:

Microstructure, Mechanical and Electrical Properties of Copper Matrix Composites Reinforced with Steel Nanoparticles

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خلاصه مقاله:

In this study, copper matrix composites reinforced by ۲.۵، ۵.۵، and ۸ wt% steel nanoparticles less than ۱۳۰ nm in diameter were prepared by the casting method. The steel nanoparticles were made of steel machining chips. Disc mill and ball mill instruments were used to produce nanoparticles from machining chips. Copper was melted using an induction furnace, and the steel nanoparticles were injected into the copper melt by gas gun. The nanoparticle content effect on microstructure, mechanical properties, fracture toughness, and electrical conductivity of the composites are investigated in this paper. Increasing the reinforcement content to ۲.۵ wt% in the produced composite increases the yield strength, tensile strength, and ductility by ۲۰٪، ۴۹٪، and ۱۳٪، respectively, and then the strengthening effects deteriorate. By increasing the nanoparticle content, elongation and ductility almost continuously increase. Maximum elongation and Charpy impact energy of ۹۰ J and ۳۷٪ are achieved in this research for the composite grade reinforced by ۸ wt% of steel nanoparticles that these values are almost ۸.۲ and ۱.۲ times greater than impact energy and elongation of the pure copper sample. Furthermore, the addition of steel nanoparticles shows a little adverse effect on the electrical conductivity but dramatically improves the composite toughness.

کلمات کلیدی:

Metal matrix composite, Steel nanoparticles, Impact energy, Electrical conductivity

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