

Fabrication and characterization of Al₂O₃ nanoparticle reinforced aluminium matrix composite via powder metallurgy

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ABSTRACT

In this study, aluminium-aluminium oxide (Al-Al₂O₃) metal matrix nanocomposites (MMNCs) with the different volume content of Al₂O₃ reinforcement were prepared. Three different types Al- Al₂O₃ nanocomposite specimens comprise of 10%, 15% and 20% volume fractions of Al₂O₃ were fabricated using conventional powder metallurgy (PM) route and their microstructure and mechanical properties were determined. The samples were prepared under 200 kN compaction load and 630 °C sintering temperature. The correlation between microstructure and mechanical properties due to the inclusion of Al₂O₃ nanoparticles were investigated. The optical micrographs revealed that the Al₂O₃ nanoparticles are almost uniformly distributed in the Al matrix with good bonding between matrix and reinforcement. Moreover, the mechanical properties including hardness, tensile strength and compressive strength of the nanocomposite increase with increasing volume fraction of the reinforcement. However, the impact strength decreases once the Al₂O₃ nanoparticles increase in the composite.

KEYWORDS

Metal matrix composite (MMC); Fabrication; Characterization; Powder metallurgy

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