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Fabrication and Characterization of Synergistic Al-SiC-GNPs Hybrid Composites

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Abstract

The traditional aluminum matrix composites were fabricated using pure graphene nanoplatelets (GNPs) and silicon carbide (SiC) in aluminum matrix due to the solid lubricant properties of GNPs and high hardness, compressive strength of SiC. However, a few studies are available on the effect of the binary SiC-GNPs reinforced aluminum hybrid composites in large scale. In this study, aluminum matrix was reinforced with pure SiC (varying from 0 to 30wt.%), GNPs (changing from 0.1 to 0.5wt.%) and their hybrid form (SiC-GNPs) by powder metallurgy method. From the results, hardness was improved to 79±2 HV (Al-30SiC) and 57±2.5 HV (Al-0.1GNPs) from 28±2 HV, respectively. Similarly, compressive strength of the pure SiC and GNPs reinforced aluminum composite was enhanced to 221±6 (Al-30SiC) and 138±4 MPa (Al-0.5GNPs) from 106±4 MPa, respectively. Interestingly, the highest hardness and compression strength of the hybrid composites were measured as 85±2.6 HV (Al-30SiC-0.5GNPs) and 271±7 MPa (Al-30SiC-0.1GNPs), respectively.

Keywords: Aluminum, silicon carbide, graphene, hybrid composite, powder metallurgy