EFFECTS OF SiC and B_4C ADDITIONS ON MECHANICALLY ALLOYED and SINTERED Al12 wt.% Si COMPOSITES

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Manufacturing of aluminum metal matrix composites (AMMCs) through powder metallurgy route and effects of SiC and B_4C additions on the microstructural and physical properties of Al12 wt.% Si composites were investigated. Powder blends of Al12 wt.% Si, Al12 wt.% Si-10 wt.% SiC and Al12 wt.% Si-10 wt.% B_4C were mechanically alloyed (MA'd) using a Spex™ mill for different times. MA'd composite powders were compacted in a hydraulic press at 400 MPa and sintered under vacuum followed by inert Ar gas flowing conditions at 570°C for 2h on the basis of a previous nonisothermal DTA investigation. Microstructural and phase characterizations of composite powders and sintered samples were carried out via SEM and XRD analyses. TOPAS™ software was used to compute the crystallite sizes and lattice deformations of the powders. Density measurements, hardness measurements and wear resistance measurements were carried out on the sintered samples. Microhardness values and wear resistances of the sintered samples increased with mechanical alloying times and addition of SiC and B_4C in the Al12 wt.% matrix. On the other hand, relative densities of sintered samples were decreased with increasing mechanical alloying time and addition of SiC and B_4C in the Al12 wt.% matrix.

Keywords: Metal matrix composites, Aluminum metal matrix composites, mechanical alloying, X-Ray diffraction.