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Effect of compaction pressure and sintering temperature on mechanically-alloyed aluminium-copper-graphite nanocomposite

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ABSTRACT

Aluminium-copper composite is an alternative material for replacing Al alloys in automotive parts. One of strategies on improvement of Al-Cu composite properties is by correct processing method such as a combination of mechanical alloying and powder metallurgy. In this study, the effects of compaction pressure and sintering temperature on structural properties and microstructural properties of mechanically-alloyed Al-Cu-graphite composite were discussed. Elemental powder of Al, Cu and graphite were milled in a planetary ball milling for 10 h. Then, the as-milled composite was cold-compacted for 300, 600, 900 and 1100 MPa and undergo sintering at 400, 450, 500 and 550°C. As-milled and sintered Al-Cu-graphite composite were characterized for phase identification, structural properties, microstructural and density. The result showed that after milling, the composite consists of starting materials but after sintering new phases was formed. Cu_2O and CuO co-exist at 500°C and Al_2Cu started to form at 550°C as Cu_2O diminished. The morphology of sintered Al-Cu-graphite showed has denser structure with the presence of Al-rich and Cu-rich regions. The increment of the green density was resulted from increased of compaction pressure and sintering temperature. At higher sintering temperature (550°C), sintered density was reduced due to the presence of Al_2Cu that slower the diffusion process during sintering.



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