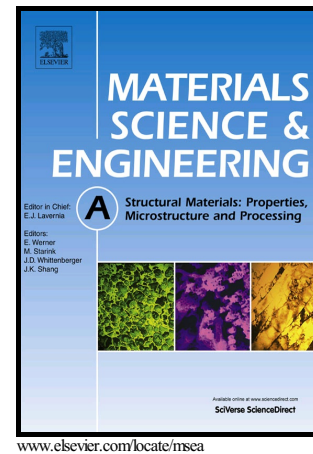


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Precipitate characteristics and synergistic strengthening realization of graphene nanoplatelets reinforced bimodal structural magnesium matrix composites

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**Precipitate characteristics and synergistic strengthening realization
of graphene nanoplatelets reinforced bimodal structural magnesium
matrix composites**

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Abstract

This study investigates the precipitation behavior in the graphene nanoplatelets (GNPs) reinforced bimodal structural Mg-6Zn (wt.%) matrix composite. The GNPs with an increasing content progressively accelerate the age-hardening response in the local regions of the composite. The composite takes only half the time that the Mg-6Zn alloy needs to reach the peak strength when aging at 200 °C. The observation reveals that the planar and wrinkled GNPs in the composite act as the effective trigger of dislocations and collector of solute atoms to accelerate the precipitation. It is concluded that GNPs have a pronounced effect on the development of matrix microstructure. Moreover, the orientation relationship between the aligned GNPs towards the extrusion direction and the matrix grains with a fiber type texture makes the GNPs and $[0001]_{\text{Mg}}$ precipitate rods constitute a hybrid strengthening architecture in the composite. As a result, the synergistic strengthening effect of the GNPs and the precipitates is realized.

Keywords: Metal matrix composites; Graphene; Precipitation; Mechanical properties

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