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Enhanced overall strength and ductility of magnesium matrix composites by low content of graphene nanoplatelets

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Abstract: This work focuses on the microstructure, strengthening and plastic deformation of low content graphene nanoplatelets (GNPs) reinforced magnesium (Mg) matrix composites. The GNPs with the homogeneous dispersion and distribution realised through the disintegrated melt deposition technique improve the overall strength and ductility of composites significantly and efficiently. The yield strength improvement is mainly attributed to (i) the effective load transfer owing to the high specific surface area and the interlock effect from the wrinkled two-dimensional GNPs, and (ii) the grain refinement by the GNPs induced twin lamellae. Besides, (i) the promoted $\{10\bar{1}2\}$ extension twins that maintain the grains with favourable orientations for basal slip and (ii) the initiation of the prismatic <*a*> slip play important roles in the toughening effect of composites, which are discussed in detail. This study highlights the advantage of GNPs in tuning the metal matrix composites with high strength and high ductility simultaneously.

Key words: A. Metal matrix composites (MMCs); A. Graphene; B. Mechanical properties; D. Microstructural analysis