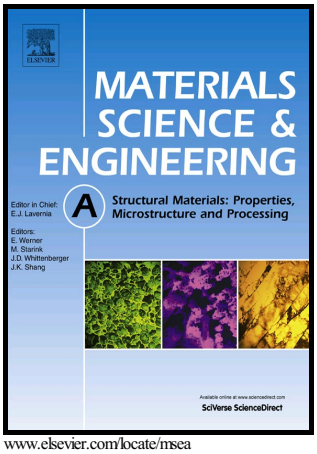
Precipitate characteristics and synergistic strengthening realization of graphene nanoplatelets reinforced bimodal structural magnesium matrix composites

S.L. Xiang, X.S. Hu, X.J. Wang, L.D. Wang, K. Wu



www.elsevier.com/locate/msea

PII: S0921-5093(18)30477-5
DOI: https://doi.org/10.1016/j.msea.2018.03.107
Reference: MSA36300

To appear in: *Materials Science & Engineering A*

Received date: 2 November 2017
Revised date: 16 February 2018
Accepted date: 27 March 2018

Cite this article as: S.L. Xiang, X.S. Hu, X.J. Wang, L.D. Wang and K. Wu, Precipitate characteristics and synergistic strengthening realization of graphene nanoplatelets reinforced bimodal structural magnesium matrix composites, *Materials Science & Engineering A,* https://doi.org/10.1016/j.msea.2018.03.107

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

S.L. Xiang, X.S. Hu, X.J. Wang*, L.D. Wang, K. Wu

School of Materials Science and Engineering, Harbin Institute of Technology, 92 West Da-Zhi Street, Harbin 150001, P.R. China

**Corresponding author. Tel: +86 45186402291. E-mail address: xjwang@hit.edu.cn (X.J. Wang).*

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 ^{o}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 $[0001]_{Mg}$ 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