

Accepted Manuscript

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PII: S1359-835X(18)30191-X

DOI: <https://doi.org/10.1016/j.compositesa.2018.05.012>

Reference: JCOMA 5037

To appear in: *Composites: Part A*

Received Date: 26 March 2018

Revised Date: 5 May 2018

Accepted Date: 11 May 2018



Please cite this article as: Xu, R., Tan, Z., Fan, G., Ji, G., Xiong, D-B., Guo, Q., Su, Y., Li, Z., Zhang, D., High-strength CNT/Al-Zn-Mg-Cu composites with improved ductility achieved by flake powder metallurgy via elemental alloying, *Composites: Part A* (2018), doi: <https://doi.org/10.1016/j.compositesa.2018.05.012>

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High-strength CNT/Al-Zn-Mg-Cu composites with improved ductility achieved by flake powder
metallurgy via elemental alloying

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Abstract: The uniform dispersion of carbon nanotubes (CNTs) is usually accompanied by severe grain refinement of Al matrix, which leads to the low ductility of CNT/Al alloy composites. To accommodate this dilemma, a flake powder metallurgy route via elemental alloying was proposed to fabricate CNT/Al-Zn-Mg-Cu composites with improved ductility and high strength. CNT/Al flake powders were firstly obtained by ball milling at a low speed to achieve uniform dispersed of CNTs, and then milled with Zn, Mg and Cu elemental flake powders at a high speed to achieve lamellar CNT/Al-Zn-Mg-Cu particles, which were consolidated and homogenized to obtain bulk CNT/Al-Zn-Mg-Cu composites. Compared with the CNT/AA7075 counterparts fabricated by directly using CNTs and atomized AA7075 powders, the CNT/Al-Zn-Mg-Cu composites exhibited improved ductility with high modulus and strength, due to the well-protected and uniformly aligned CNTs, and good dislocation storage capability of the elongated ultrafine grains.

Keywords: A. Metal-matrix composites (MMCs); A. Carbon nanotubes and nanofibers; B. Mechanical properties; E. Powder processing;

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