Accepted Manuscript

Mechanical properties and microstructure characterization of well-dispersed carbon nanotubes reinforced copper matrix composites

Hui Deng, Jianhong Yi, Chao Xia, Yi Yi

PII: S0925-8388(17)32860-8

DOI: 10.1016/j.jallcom.2017.08.131

Reference: JALCOM 42888

To appear in: *Journal of Alloys and Compounds*

Received Date: 13 March 2017

Revised Date: 11 July 2017

Accepted Date: 14 August 2017

Please cite this article as: H. Deng, J. Yi, C. Xia, Y. Yi, Mechanical properties and microstructure characterization of well-dispersed carbon nanotubes reinforced copper matrix composites, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.08.131.

Mechanical properties and microstructure characterization of well-dispersed carbon nanotubes reinforced copper matrix composites

Hui Deng[a], Jianhong Yi[1a,b,*], Chao Xia[a], Yi Yi[a]

[a]State Key Laboratory of Powder Metallurgy, Central South University, Changsha 410083, China

[b]College of Material Science and Engineering, Kunming University of Science and Technology, Kunming 650093, China

Abstract: Copper (Cu) matrix composites reinforced with 0.3, 0.5, 1.0, and 2.0 vol% multi-wall carbon nanotubes (MWCNTs) were processed by ultrasonication and high-energy attritor milling of pure copper powder with carbon nanotubes (CNTs), followed by spark plasma sintering and annealing. Microstructural characterization shows that the CNTs are well-dispersed in Cu-0.5 vol% CNTs composite, and the aggregation of CNTs increases with the increase in the volume fraction of carbon nanotubes. Raman spectroscopy results indicate that there is an increase in the number of defects in the nanotube after milling and sintering of the composite. Mechanical property and strengthening mechanism analysis indicates that the grain size effect, hindering effect of dislocations interacting with the grain boundary, and load transfer effect are the main mechanisms affecting the mechanical properties of composites, and the experimental strength of the composite can be close to 81% of the theoretical strength.

Keywords: Copper matrix composite; Carbon nanotube; Spark plasma sintering; Mechanical property

* Corresponding author at: State Key Laboratory of Powder Metallurgy, Central South University, Changsha 410083, China. Tel.: +8673188877328; fax: +8673188710855. E-mail addresses: charnopk@126.com (H. Deng), jianhong@csu.edu.cn (J. Yi).