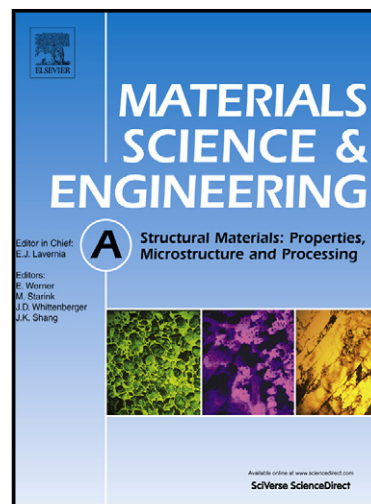


Author's Accepted Manuscript

Microstructure and properties of bulk copper matrix composites strengthened with various kinds of graphene nanoplatelets

Jan Dutkiewicz, Piotr Ozga, Wojciech Maziarz, Janusz Pstruś, Bogusz Kania, Piotr Bobrowski, Justyna Stolarska



www.elsevier.com/locate/msea

PII: S0921-5093(15)00032-5
DOI: <http://dx.doi.org/10.1016/j.msea.2015.01.018>
Reference: MSA31956

To appear in: *Materials Science & Engineering A*

Received date: 22 September 2014

Revised date: 30 December 2014

Accepted date: 9 January 2015

Cite this article as: Jan Dutkiewicz, Piotr Ozga, Wojciech Maziarz, Janusz Pstruś, Bogusz Kania, Piotr Bobrowski, Justyna Stolarska, Microstructure and properties of bulk copper matrix composites strengthened with various kinds of graphene nanoplatelets, *Materials Science & Engineering A*, <http://dx.doi.org/10.1016/j.msea.2015.01.018>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Microstructure and properties of bulk copper matrix composites strengthened with various kinds of graphene nanoplatelets

Jan Dutkiewicz, Piotr Ozga, Wojciech Maziarz, Janusz Pstruś, Bogusz Kania, Piotr Bobrowski, Justyna Stolarska

Institute of Metallurgy and Materials Science of Polish Academy of Sciences, 25, Reymonta St., 30-059 Kraków

Corresponding author: J. Dutkiewicz, phone: 48-12-2952861; fax: 48-12-2952804; e-mail: j.dutkiewicz@imim.pl

Abstract: Copper matrix composites strengthened with graphene were prepared by vacuum uniaxial hot pressing of ball milled mixtures of powders. Two grades of graphene platelets were used; one with thickness of 10-20 nm and with lateral size of less than 14 μm and another with much lower thickness of platelets of 2-4 nm and in (002) plane crystallite size below 100 nm. Hot pressing in vacuum allowed obtaining composites containing 1 and 2 wt. % of graphene. The addition of fine graphene led to about 50% higher hardness and about 30% lower electrical resistivity than composite with coarse graphene platelets. SEM studies of samples with fine graphene additions showed much more homogeneous microstructure than those containing coarse graphene. Based on TEM studies, copper particle size was estimated between 100-300 nm, and smaller in the areas of copper particle boundaries, where plastic deformation of copper particles brought about mixing nanocrystalline copper and graphene phases. Graphite conglomerates were identified using electron diffraction and often consisted of elongated platelets of thickness up to 20 nm in both graphene composites studied. Raman spectra confirmed nonhomogeneity of graphene in bulk composites and showed increase of defect density within graphene platelets, as was assessed from low intensity of $I(2D)/I(G)$, equal to 0.12-1.02 compared with 3.5-4, in places of high graphene concentration in both kinds of samples. The weak signal in more homogeneously distributed graphene in samples with fine graphene additions confirmed similar structural features.

Keywords: Metal matrix composites; graphene; powder metallurgy; TEM and SEM electron microscopy; electrical resistivity

Download English Version:

<https://daneshyari.com/en/article/7978320>

Download Persian Version:

<https://daneshyari.com/article/7978320>

[Daneshyari.com](https://daneshyari.com)