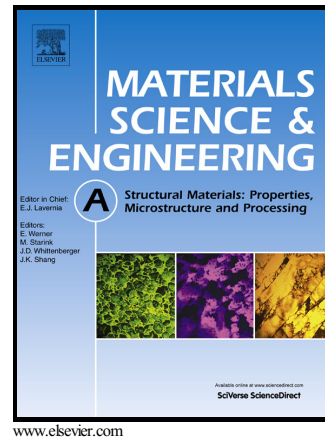


Author's Accepted Manuscript

Mechanical and thermal properties of reduced graphene oxide reinforced aluminum nitride ceramic composites

Hongyan Xia, Xia Zhang, Zhongqi Shi, Changjian Zhao, Yongfeng Li, Jiping Wang, Guanjun Qiao



www.elsevier.com

PII: S0921-5093(15)00498-0
DOI: <http://dx.doi.org/10.1016/j.msea.2015.04.091>
Reference: MSA32315

To appear in: *Materials Science & Engineering A*

Received date: 21 February 2015

Revised date: 25 April 2015

Accepted date: 27 April 2015

Cite this article as: Hongyan Xia, Xia Zhang, Zhongqi Shi, Changjian Zhao, Yongfeng Li, Jiping Wang and Guanjun Qiao, Mechanical and thermal properties of reduced graphene oxide reinforced aluminum nitride ceramic composites, *Materials Science & Engineering A*, <http://dx.doi.org/10.1016/j.msea.2015.04.091>

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.

Mechanical and thermal properties of reduced graphene oxide reinforced aluminum nitride ceramic composites

Hongyan Xia^a, Xia Zhang^a, Zhongqi Shi^{a,*}, Changjian Zhao^a, Yongfeng Li^a, Jiping Wang^a, Guanjun

Qiao^{a,b}

a. State Key Laboratory for Mechanical Behavior of Materials, Xi'an Jiaotong University, Xi'an 710049, China

b. School of Materials Science and Engineering, Jiangsu University, Zhenjiang 212013, China

Abstract:

High density reduced graphene oxide (rGO) reinforced aluminum nitride (AlN) composites were successfully fabricated by one-step spark plasma sintering (SPS) method. Raman spectra showed that the raw material of GO was thermal reduced to rGO during the SPS process, and the reduction of GO can be strongly affected by the carbonaceous atmosphere. With the rGO content increasing (0–2 wt.%), the dispersion of rGO and relative density of the composites decreased, made the elastic modulus and hardness decreased accordingly. Whereas the flexural strength had a slight increase when rGO content was ≤ 1 wt.%, and the fracture toughness increased from 3.5 to 5.2 MPa·m^{1/2} with the rGO due to the crack bridging and pull out of rGO. The thermal conductivity of the composites was low and sharply decreased from 92.5 to 37.4 W·m⁻¹·K⁻¹ with the addition of rGO, which are attributed to the low crystalline quality and high vacancy defects in rGO and the increase of interfacial thermal resistance.

Keywords: Reduced graphene oxide; Aluminum nitride; Mechanical properties; Thermal properties

1. Introduction

Graphene, as an allotrope of carbon consisting of a single layer of sp² bonded carbon atoms, has recently attracted tremendous attention due to its excellent mechanical, thermal, and electrical properties, such as high Young's modulus (1 TPa), high fracture strength (125 GPa), extreme thermal

* Corresponding author. Tel.: +86 29 82667942; fax: +86 29 82663453.
E-mail address: zhongqishi@mail.xjtu.edu.cn (Z. Shi)

Download English Version:

<https://daneshyari.com/en/article/7977486>

Download Persian Version:

<https://daneshyari.com/article/7977486>

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