

Accepted Manuscript

Microstructure and mechanical properties of carbon fiber needled felt reinforced sol-derived YAG composite

Borong Shan, Qingsong Ma, Kuanhong Zeng



PII: S0925-8388(18)33318-8

DOI: [10.1016/j.jallcom.2018.09.080](https://doi.org/10.1016/j.jallcom.2018.09.080)

Reference: JALCOM 47499

To appear in: *Journal of Alloys and Compounds*

Received Date: 10 May 2018

Revised Date: 27 August 2018

Accepted Date: 8 September 2018

Please cite this article as: B. Shan, Q. Ma, K. Zeng, Microstructure and mechanical properties of carbon fiber needled felt reinforced sol-derived YAG composite, *Journal of Alloys and Compounds* (2018), doi: 10.1016/j.jallcom.2018.09.080.

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 proof before it is published in its final 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 mechanical properties of carbon fiber needled felt reinforced sol-derived YAG composite

Borong Shan, Qingsong Ma*, Kuanhong Zeng

*Science and Technology on Advanced Ceramic Fibers & Composites Laboratory, National University of Defense Technology,
Changsha 410073, P. R. China*

Abstract

The study concerning the second phase reinforced YAG matrix composites is few although YAG is well known as a desirable thermo structural ceramic. In this paper, low-cost 3D carbon fiber needled felt was used as reinforcement to improve the fracture toughness of YAG, and the carbon fiber needled felt reinforced YAG (C/YAG) composite was fabricated through ~~the route of~~ vacuum impregnation-drying-heat treatment, using the $Y_2O_3-Al_2O_3$ sol with a high solid content as raw material. The microstructure, mechanical properties, thermal stability and oxidation resistance of C/YAG composite were carefully investigated. Due to the characteristics of reinforcement and the microstructure, the as-fabricated C/YAG composite showed non-catastrophic failure behavior and much higher fracture toughness ~~as compared with monolithic YAG ceramic, and the mechanical properties of composite are acceptable and have much room for improvement.~~ The flexural strength of C/YAG composite was well retained after annealed at 1700 °C and 1800 °C under inert atmosphere. Although the chemical inertness between carbon fiber and YAG was confirmed up to 1800 °C, the physical bonding of interface was enhanced during annealing, which led to the decrease of fracture work, especially at 1800 °C. The oxidation resistance of C/YAG composite was related to the cracks and pores since YAG is immune to oxidation. The changes of microstructure and flexural strength after oxidation at 1200 °C, 1400 °C and 1600 °C were characterized and analyzed.

Keywords: Yttrium aluminum garnet composite; Carbon fiber needled felt; Mechanical properties; Thermal stability; Oxidation resistance

1. Introduction

Polycrystalline yttrium aluminum garnet ($Y_3Al_5O_{12}$, YAG) ceramic has been studied for many years and is widely known as an important solid-state laser host material because of its excellent optical performance [1–4].

*Corresponding author. Tel.: +86 731 84573168; Fax: +86 731 84576578.

E-mail address: nudtmqs1975@163.com (Q.S. Ma).

Download English Version:

<https://daneshyari.com/en/article/10155975>

Download Persian Version:

<https://daneshyari.com/article/10155975>

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