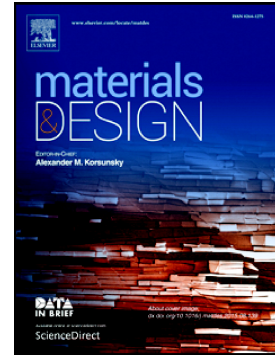


Accepted Manuscript

Simultaneous improvement of interfacial strength and toughness between carbon fiber and epoxy by introducing amino functionalized ZrO₂ on fiber surface

Qing Wu, Ruyi Zhao, Qianli Liu, Tong Jiao, Jianfeng Zhu, Fen Wang



PII: S0264-1275(18)30240-5
DOI: doi:[10.1016/j.matdes.2018.03.054](https://doi.org/10.1016/j.matdes.2018.03.054)
Reference: JMADE 3796
To appear in: *Materials & Design*
Received date: 28 November 2017
Revised date: 25 March 2018
Accepted date: 26 March 2018

Please cite this article as: Qing Wu, Ruyi Zhao, Qianli Liu, Tong Jiao, Jianfeng Zhu, Fen Wang , Simultaneous improvement of interfacial strength and toughness between carbon fiber and epoxy by introducing amino functionalized ZrO₂ on fiber surface. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Jmade*(2017), doi:[10.1016/j.matdes.2018.03.054](https://doi.org/10.1016/j.matdes.2018.03.054)

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.

Simultaneous improvement of interfacial strength and toughness between carbon fiber and epoxy by introducing amino functionalized ZrO₂ on fiber surface

Qing Wu ^{a,*}, Ruyi Zhao ^a, Qianli Liu ^b, Tong Jiao ^a, Jianfeng Zhu ^a, Fen Wang ^a

^a School of Materials Science and Engineering, Shaanxi University of Science & Technology,
Xi'an 710021, China

^b Shanghai Composites Science & Technology Co., Ltd., Shanghai 201112, China

Abstract

Amino-functionalized ZrO₂ was prepared and incorporated on carbon fiber surface by a simple dip-coating approach to simultaneously strengthen and toughen the interphase of carbon fiber/epoxy composite. Fourier transform infrared spectroscopy, X-ray photoelectron spectroscopy and thermogravimetry confirmed the successful functionalization of ZrO₂ by (3-Aminopropyl) triethoxysilane (APTES-ZrO₂). Scanning electron microscopy and atomic force microscope demonstrated that uniform coating with well dispersed particles on fiber surface was achieved at 1.0 wt.% addition of APTES-ZrO₂ particles. Under this condition, the interfacial shear strength (IFSS) and fracture toughness (G_{ic}) revealed respective 41.3% and 257.6% augments, compared with epoxy-only coated fiber composite. The enhanced IFSS is attributed to the improved chemical bonds between fiber and resin. While the increase in G_{ic} can be ascribed to the intermittent distribution of strong/weak bonding zones and the mobility of APTES-ZrO₂ particles in the interphase region. This work affords a simple, scalable and cost effective approach to simultaneously increase the interfacial strength and toughness of composites, which has always been sought after for structural materials.

Keywords

Carbon fiber; Polymer-matrix composites; Surface treatment; Interface/interphase; Sizing

* Corresponding Author

E-mail: wuqing@sust.edu.cn

Download English Version:

<https://daneshyari.com/en/article/7217059>

Download Persian Version:

<https://daneshyari.com/article/7217059>

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