Accepted Manuscript

Synergistic interfacial reinforcement of carbon fiber/polyamide 6 composites using carbon-nanotube-modified silane coating on ZnO-nanorod-grown carbon fiber

Byeong-Joo Kim, Sang-Hyup Cha, Kyungil Kong, Wooseok Ji, Hyung Wook Park, Young-Bin Park

PII: S0266-3538(18)30854-6

DOI: 10.1016/j.compscitech.2018.07.015

Reference: CSTE 7301

To appear in: *Composites Science and Technology*

Received Date: 9 April 2018

Revised Date: 3 July 2018

Accepted Date: 6 July 2018

Please cite this article as: Kim B-J, Cha S-H, Kong K, Ji W, Park HW, Park Y-B, Synergistic interfacial reinforcement of carbon fiber/polyamide 6 composites using carbon-nanotube-modified silane coating on ZnO-nanorod-grown carbon fiber, *Composites Science and Technology* (2018), doi: 10.1016/j.compscitech.2018.07.015.

Synergistic interfacial reinforcement of carbon fiber/polyamide 6 composites using carbon-nanotube-modified silane coating on ZnO-nanorod-grown carbon fiber

Byeong-Joo Kim, Sang-Hyup Cha, Kyungil Kong, Wooseok Ji, Hyung Wook Park, Young-Bin Park*

Department of Mechanical and Aerospace Engineering, Ulsan National Institute of Science and Technology, UNIST-gil 50, Ulju-gun, Ulsan 44919, Republic of Korea

*To whom correspondence should be addressed:

Phone: +82-52-217-2314, Fax: +82-52-217-2439, Email: ypark@unist.ac.kr

Abstract

We report an experimental study on improvement of mechanical properties of a multiscale hybrid composite consisting of *in-situ* polymerized polyamide-6 and zinc oxide nanorod(ZnO NR)-grown woven carbon fiber (WCF) coated with carbon nanotube(CNT)-modified silane. The ZnO growth process and silane coating process were performed on the fiber surface, and then the composite was fabricated by ultra-fast (< 30 s from infusion to polymerization) thermoplastic resin transfer molding technique with extremely low viscosity of resin. The ZnO NRs formed mechanical interlocking with polymer matrix, and at the same time, the CNTs-modified silane layer on WCFs and ZnO NRs formed covalent bond with the matrix; therefore, they induced strong interaction between matrix and fibers, thereby resulting in remarkable improvements in the mechanical properties of the composite. The morphology, coating thickness and composition of the CNTs-modified silane/ZnO/WCF surface according to amount of the silane coupling agent were analyzed and their effects on mechanical