Accepted Manuscript

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PII: S1359-8368(14)00254-6
DOI: http://dx.doi.org/10.1016/j.compositesb.2014.06.010
Reference: JCOMB 3060

To appear in: *Composites: Part B*

Received Date: 28 July 2013
Revised Date: 2 January 2014
Accepted Date: 17 June 2014

Please cite this article as: Boroujeni, A.Y., Tehrani, M., Nelson, A.J., Al-Haik, M., Hybrid Carbon Nanotube-Carbon Fiber Composites with Improved In-plane Mechanical Properties, *Composites: Part B* (2014), doi: http://dx.doi.org/10.1016/j.compositesb.2014.06.010

Hybrid Carbon Nanotube-Carbon Fiber Composites with Improved In-plane Mechanical Properties

A. Y. Boroujeni[1], M. Tehrani[2], A. J. Nelson[1], M. Al-Haik[*, 1]

[1]*Department of Engineering Science and Mechanics, Virginia Tech, Blacksburg, VA 24061, USA*

[2]*Department of Mechanical Engineering, University of New Mexico, Albuquerque, NM 87131, USA*

Abstract

In this study carbon nanotubes (CNTs) were grown on carbon fibers to enhance the in-plane and out-of-plane properties of fiber reinforced polymer composites (FRPs). A relatively low temperature synthesis technique was utilized to directly grow CNTs over the carbon fibers. Several composites based on carbon fibers with different surface treatments (e.g. growing CNTs with different lengths and distribution patterns and coating the fibers with a thermal barrier coating (TBC) layer) were fabricated and characterized via on- and off-axis tensile tests. The on-axis tensile strength and ductility of the hybrid FRPs were improved by 11% and 35%, respectively, due to the presence of the TBC and the surface grown CNTs. This configuration also exhibited 16 % improvement on the off-axis stiffness. Results suggest that certain CNT growth patterns and lengths are more pertinent than the other surface treatments to achieve superior mechanical properties.

Keywords: A. Carbon fibre, D. Mechanical testing, A. Nano-structures, E. Surface treatments.

[*] Corresponding author, alhaik@vt.edu, 540-231-5442