Accepted Manuscript

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PII: S0266-3538(16)30396-7

DOI: 10.1016/j.compscitech.2016.09.007

Reference: CSTE 6512

To appear in: *Composites Science and Technology*

Received Date: 27 May 2016

Revised Date: 6 September 2016

Accepted Date: 7 September 2016

Please cite this article as: Pathak AK, Borah M, Gupta A, Yokozeki T, Dhakate SR, Improved mechanical properties of carbon fiber/graphene oxide-epoxy hybrid composites, *Composites Science and Technology* (2016), doi: 10.1016/j.compscitech.2016.09.007.

Improved mechanical properties of carbon fiber/graphene oxide-epoxy hybrid composites

Abhishek K. Pathak[a,b], Munu Borah[a, b], Ashish Gupta[a, b], T. Yokozeki[c] and Sanjay R. Dhakate*[a,b]

[a] Advance Carbon Products section, Advance Materials and Devices Division, CSIR-National Physical Laboratory, Dr. K.S. Krishnan Marg, New Delhi 110012
[b] Academy of Scientific Innovation and Research (AcSIR), NPL, New Delhi
[c] Department of Aeronautics and Astronautics, Graduate School of Engineering, The University of Tokyo, Tokyo, Japan

Abstract

The mechanical properties of carbon fiber reinforced polymer composites depend upon fiber-matrix interfacial properties. In this investigation to improve the mechanical properties of polymer composites, graphene oxide was used as one of the filler for the development of carbon fiber/graphene oxide-epoxy hybrid composites. Initially, epoxy resin was modified by incorporating different weight% of graphene oxide from 0.1 to 0.6 weight%. The desired size of carbon fiber fabric was impregnated with modified epoxy resin to develop hybrid composites by compression molding technique. The graphene oxide synthesized was characterized by various techniques such as FTIR, XPS, NMR, XRD and Raman Spectroscopy. It is observed that graphene oxide synthesized possesses different type of functional groups which are responsible for making interactions with epoxy resin and Carbon fibers. The hybrid composite flexural strength increases by 66%, flexural modulus by 72%, while interlaminar shear strength increases by 25% at 0.3 weight% of graphene oxide included in the carbon fiber reinforced polymer hybrid composites. The enhancement in the properties of composites at the percolation threshold of graphene oxide is due to hydrogen type bonding and mechanical interlocking of graphene oxide with carbon fibers and epoxy resin. The graphene oxide utilization is one of the approaches for improving the properties of carbon fiber polymer composites.

Keywords: Carbon fibers, Hybrid composites, Photoelectron spectroscopy, Mechanical properties

***Corresponding author: Email:** dhakate@mail.nplindia.org, (S. R. Dhakate) Tel: +91-11-45609388, FAX: +91-11-45609310