Accepted Manuscript

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PII: S1359-8368(18)30810-2

DOI: 10.1016/j.compositesb.2018.07.015

Reference: JCOMB 5782

To appear in: *Composites Part B*

Received Date: 12 March 2018

Revised Date: 15 May 2018

Accepted Date: 10 July 2018

Please cite this article as: Alsaadi M, Bulut M, Erkliğ A, Jabbar A, Nano-silica inclusion effects on mechanical and dynamic behavior of fiber reinforced carbon/Kevlar with epoxy resin hybrid composites, *Composites Part B* (2018), doi: 10.1016/j.compositesb.2018.07.015.

Nano-silica inclusion effects on mechanical and dynamic behavior of fiber reinforced carbon/Kevlar with epoxy resin hybrid composites

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Abstract. The effects of nano-silica (NS) particles inclusion on the tensile, flexural, vibration and damping characteristics of intraply and woven fiber reinforced carbon/Kevlar/epoxy (CKFRE) hybrid composites were experimentally investigated. Test samples were prepared according to ASTM standards for five different weight contents of NS particles (0.5, 1, 1.5, 2.5 and 3 wt%). Experimental modal analysis was performed only for fundamental frequency to measure damping and natural frequency for characterization of vibration properties. Results showed that 20 % improvement in tensile strength was seen at NS content of 3 wt%, while flexural strength was increased by 35.7% according to unmodified CKFRE samples. It was concluded that interaction of NS particles with epoxy and fiber leading to improve interfacial stress resulted in a significant effect on dynamic properties in terms of natural frequency and damping ratio.

Keywords: Nano-silica; Carbon/Kevlar fiber; Epoxy; Tensile; Flexural; Vibration; Damping.

1. Introduction

The applications of polymer composites have been increased to provide superior properties as incorporating high strength fibers to brittle matrix. Fiber reinforced polymer composites exhibit high specific stiffness, strength and resistance to fatigue loads in addition to ease of fabrication and low cost as compared to conventional engineering materials, like steel and aluminum. Therefore, these composites have generated wide interest in several high technology of engineering fields, especially in automobile, aerospace, sport and infrastructure industry. In