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Hierarchical structures of CNT@basalt fabric for tribological and electrical applications: Impact of growth temperature and time during synthesis

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Abstract

Hierarchical structures are continuously drawing the attention of researchers to replace traditional polymeric structures. Here, hierarchical structures of basalt fabric coated with CNTs (BF-CNTs) were prepared using chemical vapor deposition (CVD). To understand the effects of growth temperature and growth time during chemical vapor deposition on grafting of CNTs on basalt fabric, two cases were considered i.e., grafting at 600, 650, and 700 ºC for 30 min and at 650 ºC for 30, 60, and 120 min. BF-CNTs were characterized using XRD, HR-Raman, FE-SEM, and DSC. Further, BF-CNTs were sandwiched with epoxy via a hand lay-up method and their effects on the tribological and electrical properties of epoxy composites were analyzed. The results show the composites with BF-CNT prepared at higher growth temperature and for longer time possessed a lower coefficient of friction (CoF), lower wear loss, lower volume resistivity, and improved electromagnetic interference shielding effectiveness (EMI SE).

Keywords: Carbon nanotubes; Hierarchical structures; Grafting; Basalt fiber.

1. Introduction