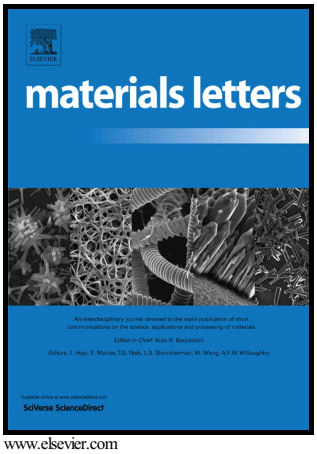

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PII: S0167-577X(16)31314-3
DOI: http://dx.doi.org/10.1016/j.matlet.2016.08.036
Reference: MLBLUE21320

To appear in: *Materials Letters*

Received date: 27 April 2016
Revised date: 23 July 2016
Accepted date: 8 August 2016

Cite this article as: Hongfeng Tang, Guang-Xin Chen and Qifang Li, Epoxy based high-k composites with low dielectric loss caused by reactive core-shell structured carbon nanotube hybrids, *Materials Letters* http://dx.doi.org/10.1016/j.matlet.2016.08.036

Epoxy-based high-k composites with low dielectric loss caused by reactive core-shell-structured carbon nanotube hybrids

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Abstract

Polymer composites with a high dielectric constant (high-k) and low dielectric loss represent an important research topic for the rapid development of electronic industries. This paper reports on a type of high-k composite with low dielectric loss (dielectric constant is approximately 152, and dielectric loss is only 0.06 at 10 KHz) through a compounded epoxy resin with homemade core-shell-structured carbon nanotube (CNT) hybrids. The composite is prepared by in situ controlled free-radical copolymerization of divinylbenzene and glycidyl methacrylate on the surface of CNTs. The reactive shell contained epoxy groups that play a dual role in keeping the low dielectric loss of the composites and high dispersibility of the coated CNTs. The coated CNTs with proper thickness (about 30 nm) and epoxy value (0.011 mol/g) were selected to prepare the composites.

Keywords: Carbon nanotubes; core-shell structure; hybrids; composites

1. Introduction

With the development of electronic technology, the preparation of electronic materials with enhanced performance has drawn considerable research attention[1-3]. Given their advantages of light weight, good processability, and low cost, polymer-based high dielectric constant composites have significant applications in capacitors, actuators, and electromagnetic interference shielding materials[4-8]. The incorporation of conductive fillers, such as metal particles and carbon fillers, into polymers can significantly improve the dielectric constant[9, 10]. However, the high loading of fillers