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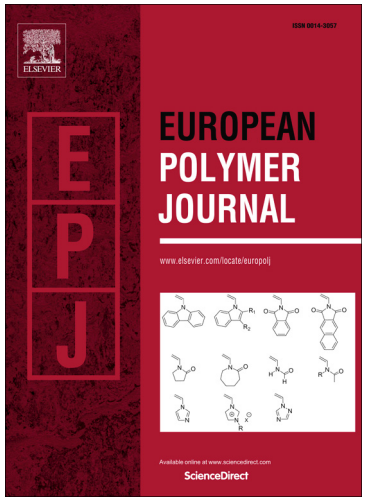

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PII: S0014-3057(16)31019-9
DOI: http://dx.doi.org/10.1016/j.eurpolymj.2017.01.023
Reference: EPJ 7684

To appear in: *European Polymer Journal*

Received Date: 28 September 2016
Revised Date: 7 January 2017
Accepted Date: 19 January 2017

Please cite this article as: Kuester, S., Demarquette, N.R., Carlos Ferreira, J. Jr., Soares, B.G., M. O. Barra, G., HYBRID NANOCOMPOSITES OF THERMOPLASTIC ELASTOMER AND CARBON NANOADDITIVES FOR ELECTROMAGNETIC SHIELDING, *European Polymer Journal* (2017), doi: http://dx.doi.org/10.1016/j.eurpolymj.2017.01.023

HYBRID NANOCOMPOSITES OF THERMOPLASTIC ELASTOMER AND CARBON NANOADDITIVES FOR ELECTROMAGNETIC SHIELDING

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ABSTRACT

Hybrid nanocomposites of poly (styrene-b-ethylene-ran-butylene-b-styrene) (SEBS), graphene nanoplatelets (GnP), and carbon nanotubes (CNT) were successfully prepared by melt compounding for electromagnetic shielding applications. The morphologies of the carbon nanoadditives and nanocomposites were investigated by Raman spectroscopy, field emission gun scanning electron microscopy, and rheological analysis. DC electrical conductivity was assessed by two-probe and four-probe techniques. Electromagnetic interference shielding effectiveness, shielding mechanisms, and dielectric properties were conducted in the X-band microwave frequency range (8.2-12.4 GHz). The results showed that CNT had a higher affinity with the matrix, and were better dispersed than GnP. SEBS/GnP/CNT nanocomposites induced an electrical conductivity increase of 17 orders of magnitude compared to the polymer matrix. The hybrid nanocomposites presented synergic effects on EMI-SE when compared to the single-component nanocomposites (SEBS/GnP and SEBS/CNT). The maximum EMI-SE of 36.47dB (reduction of 99.98% of the incident radiation) was achieved for the SEBS/GnP/CNT nanocomposite with 5/10 wt.% of GnP/CNT, respectively. All the hybrid nanocomposites with CNT loadings equal to or higher than 8 wt.%. presented the required EMI-SE for commercial applications.

Keywords: Hybrid nanocomposites; Graphene nanoplatelets; Carbon Nanotubes; Electrical properties; Electromagnetic shielding effectiveness.

1. INTRODUCTION

The current information age has clearly brought deep changes to the human way of life, with nanotechnology increasingly incorporated into our daily routine, and modern society experiencing the phenomenon of technology miniaturization. Alongside the mostly beneficial changes that this new order has ushered in, the fast and growing proliferation of equipment and mobile electronic devices, such as cell phones, laptops, and tablets, have also given rise to serious problems of electromagnetic interferences (EMI), and possibly to human diseases. As a result, shielding materials, especially those based on polymer nanocomposites consisting of insulating polymer matrices and conductive carbon nanoparticles, are being widely studied in a bid to overcome these problems [1-8].