UNIVERSITI TEKNOLOGI MARA

INFLUENCE OF CARBON NANOTUBES ON THE THERMAL AND MECHANICAL PROPERTIES OF THERMOPLASTIC NATURAL RUBBER (NR/LNR/LLDPE) COMPOSITES

HAZWANI BINTI HALIM

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as reference work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Hazwani Binti Halim
Student ID	:	2008263042
Programme	:	Master of Science (AS 780)
Faculty	:	Applied Sciences
Thesis Title	:	Influence of Carbon Nanotubes on the Thermal and Mechanical Properties of Thermoplastic Natural Rubber (NR/LNR/LLDPE) Composites
Signature of Student	:	.....
Date	:	October 2013

ABSTRACT

In this research, the plastics (LLDPE) were mixed together with liquid natural rubber (LNR) as compatibilizer and natural rubber (NR) in a percentage of volume ratios 50:10:40 respectively to perform thermoplastic natural rubber (TPNR). This TPNR was reinforced with two types of MWNTs (MWNTs 1 and MWNTs 2). MWNTs 1 is untreated MWNTs (MWNTs without acid treatment) while MWNTs 2 is acid treated MWNTs. MWNTs has been choosen to be a reinforced material (filler) in this study because its exhibit unique mechanical, electronic and magnetic properties. Therefore, this may suggest the enhancement of composites properties as well as the application of it. This blend of composites was prepared via melt blending method using Haake 600 p internal mixer. Based on the optimum parameter, these nanocomposites were prepared at 140 °C temperature, 55 rpm of mixing speed and 13 minutes of processing time. The mechanical and thermal properties of this nanocomposites have been studied with respect to the various composition of MWNTs (2 wt%, 4 wt%, 6 wt% and 8 wt%) . Dynamic mechanical analysis (DMA) and morphological observation also conducted on the composites sample. It has been found that the tensile strength, Young's modulus, and impact strength increase when the concentration of MWCNTs increase until 4 wt%. SEM micrographs have confirmed good dispersion of 2-4 wt% of MWNTs in TPNR. However the dispersion is low at higher content of MWNTs due to agglomeration of nanotubes inside the matrix. The thermal conductivity of the nanocomposites has increased with addition of MWNTs at various compositions.

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