

Physico-Mechanical, Morphological Properties of Polyvinyl Alcohol/Palm Kernel Shell/Coconut Kernel Shell Elastomeric Polymer Nanocomposites

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Abstract

In this study, the physico-mechanical and morphological properties of polyvinyl alcohol/palm kernel shell/coconut kernel shell elastomeric polymer nanocomposites (PVA/PKS/CKS EPNCs) were investigated. PVA/PKS/CKS EPNCs were prepared via solution casting method and the properties of EPNCs were characterized through Fourier transform infrared (FTIR) spectroscopy, scanning electron microscopy (SEM), tensile testing and moisture absorption test. Test results showed that increasing the PVA content increased the tensile strength properties of EPNCs as well as provided smooth with no porous surface morphology. However, beyond certain percentage of PVA content, the moisture absorption increased too. Therefore, 55wt% of PVA/PKS/CKS EPNCs was chosen as the best EPNCs as it had the best overall properties from the aspect of physico-mechanical, morphological and moisture absorption.

Keywords: Elastomeric polymer nanocomposites (EPNCs), polyvinyl alcohol, palm kernel shell, coconut kernel shell.

1. Introduction

Polymers matrix nanocomposites is defined as the combination of polymer matrix with at least one of the fillers are less 100nm in dimension [1]. The benefits of polymer nanocomposites are that it can include the improvement in macroscopic properties of products compared to conventional composite [2].

An elastomer is a polymer that undergoes an immediate, linear and reversible response to high strain to an applied force which follows the Hooke's Law [3]. This class of polymer is used in the development of polymer-based nanocomposites to improve the properties. High-performance elastomeric nanocomposites have been produced by several research groups in the past with the incorporation of different types of inorganic fillers such as silica nanoparticles, layered silicates, carbon black, multi-walled carbon nanotubes and other nanomaterials [3].

EPNCs find applications in many sectors ranging from automobile tires and conveyor belts, hoses, adhesives, aircraft industry and others [4]. Thus, elastomer nanocomposite plays important role in interior structural usage.

Agricultural wastes such as palm kernel shell and coconut kernel shell are available abundantly in Malaysia. Palm kernel shell is one of the main by product of palm oil industry, which is generating about 4 million tons per annum in Malaysia [5]. Palm kernel shell is explored as one of the potential materials to be applied in polymer matrix to give major impact in mechanical properties as well as

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Manuscript History:

Received 17 September, 2018, Revised 24 September, 2018, Accepted 26 September, 2018, Published 30 September, 2018