Properties of Wood Polymer Nanocomposites Impregnated With ST-co-EDA/Nanoclay

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Summary: Study has been made on manufactured wood polymer nanocomposites (WPNC) from Sesendok wood through impregnation of Styrene (ST), Ethyldimethylamine (EDA) and Montmorillonite (MMT) nanoclay. The impregnation process of the wood samples by vacuum-pressure method with in-situ polymerization of prepolymer mixture was used. The wood samples structural properties were investigated with Dynamic Mechanical Thermal Analysis (DMTA), Fourier Transform Infrared (FTIR), X-ray Diffraction (XRD) analysis and Scanning Electron Microscopy (SEM) found to be extensively changed upon ST-co-EDA/MMT impregnated. The mechanical properties of the WPNC samples were significantly increased by ST-co-EDA/MMT treatment. Thermal properties of WPNC samples were also evaluated using themogravimetric analysis (TGA) and an improvement in thermal stability was found for WPNC. WPNC has shown excellent resistance against weathering effect while exposed to surrounding. WPNC can be used to replace plastic and synthetice materials for its excellent properties and high market demand of the modern society.

Keywords: Wood polymer nanocomposites; Nanoclay; Copolymer; FTIR; SEM

Introduction

Wood has become the most essential resources and materials in human civilization. Their microscopic arrangement such as size, fibre orientation, structure and length represent the mechanical properties of wood materials.[1] The ecological parameters for example temperature, moisture,[2] biodegradation[3–4] and ultraviolet radiation[5] are able to affect the wood's durability. The deterioration of wood by the above factors has been a major downside and limits to the physical and mechanical properties of the wood.[6–7] The effect of atmospheric moisture to the wood can be minimized by applying appropriate chemical modification such as the fabrication of wood polymer composite (WPC).[2,8] Scanning Electron Microscopy (SEM) has been done in order to study the structural properties of wood samples. The WPNC samples' mechanical properties were significantly increased by ST-co-EDA/MMT treatment. Significant improvements were showed by the modulus of elasticity (MOE) of the WPNC samples, while the compressive modulus of woods seemed to be higher in relation to their equivalent raw wood and WPC. Thermal properties of WPNC samples were also evaluated using themogravimetric analysis (TGA) and an improvement in thermal stability was found for WPNC.

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