SURFACE MODIFICATION OF CELLULOSE NANOCRYSTAL ISOLATED FROM OIL PALM BIOMASS USING FORMIC ACID HYDROLYSIS AT DIFFERENT TEMPERATURE

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TABLE OF CONTENTS

ABSTRACT

SURFACE MODIFICATION OF CELLULOSE NANOCRYSTAL ISOLATED FROM OIL PALM BIOMASS USING FORMIC ACID HYDROLYSIS AT DIFFERENT TEMPERATURE

Nanocellulose has unique properties that are renewable ability, highly content of hydroxyl (OH) group on the surface and biodegradable nanomaterials which can used in various application. Cellulose nanocrystal (CNC) was isolated from two types of oil palm biomass which are empty fruit bunch (EFB) and oil palm mesocarp (OPM) using formic acid hydrolysis treatment at different temperature. CNC with good dispersion were than being modify using *p*-toluenesulfonic anhydride (Ts_2O). CNC and modify-CNC from both type of biomass were characterize by using Fourier Transform Infrared (FTIR), X-ray Diffraction (XRD) and Field Emission Scanning Electron Microscope (FESEM). FTIR peaks at 1200 cm^{-1} and 1700 cm^{-1} were found absence after bleaching process indicating the lignin and hemicellulose has been removed. The modify CNC spectrum show new peak revealed which is sulfoxide (S=O) at wavenumber 1400 cm^{-1} and 879 cm^{-1}. XRD spectrum exhibit the different between the CNC and modify CNC. The modify CNC from both oil palm biomass show higher crystallinity index (~99%) compare to unmodified CNC (~70%) due to present of the hydrogen bonding between OH group in nanocellulose and alkyl group in Ts_2O. The modify CNCs show face centered cubic (FCC) crystal structure. The morphology studies using FESEM show the CNC possesses needle like structure. After the modification, the morphology of CNC was rearranged to neater and denser.