Surface Modification of Cellulose Micro Fibrils Extracted from Banana Pseudo-Stem Using Bis-[3-(triethoxysilyl) propyl] tetrasulfide

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Cellulose as the most abundant biomolecule on the earth, it is on investigations to be used in several applications as a remedy for the exploitation of non-renewable resources and mismanagement of agro-industrial wastes. Banana (*Musa sapientum*) fibre is a promising source of cellulose which can be derived after harvesting while the majority of the pseudo-stems are used as a low-cost feedstock for the preparation of compost. However, the cellulose itself is not compatible with most of the materials especially, with non-polar matrices. Therefore, the extracted cellulose has to be surface modified. In this study, micro-fibrillated cellulose was prepared following an alkali treatment coupled with high-pressure defibrillation and acid treatments on fibre extracted from pseudo-stem. The resulted micro-fibrillated cellulose was characterized using Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD) and cellulose structure was confirmed. XRD studies showed 69% crystallinity of micro-fibrillated cellulose. The particle size shows a bimodal distribution where approximately 21% of the sample has an average size of 110 nm and the rest is in averaged 795 nm. The prepared micro-fibrillated cellulose was surface modified using Bis-[3-(triethoxysilyl) propyl] tetrasulfide (TESPT) following rigorous solvent extractions with ethanol and acetone through cellulose membrane. With the surface modification, the percentage crystallinity has increased up to 77.8%. Moreover, the surface modification was confirmed by the results of FTIR spectroscopy showing the stretching vibration of Si-O-C bond at 1031 cm^{-1} indicating that the surface modification was successful.

Keywords: Agro-industrial wastes, Banana fibre, Micro fibrillated cellulose, TESPT