EXTRACTION AND CHARACTERIZATION OF CELLULOSE FIBERS AND CELLULOSE NANOCRYSTALS FROM SAGO WASTE

RIA NIRMALA BINTI HASSAN

Final Year Project Proposal Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) (Chemistry with Management)
In The Faculty of Applied Sciences
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This Final Year Report Project entitled **"Extraction and Characterization of Cellulose Fibers and Cellulose Nanocrystals from Sago Waste"** was submitted by Ria Nirmala Binti Hassan, in partial fulfilment of the requirement for Degree of Bachelor of Science (Hons.) Chemistry with Management, in the Faculty of Applied Science, and was approved by

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ABSTRACT

EXTRACTION AND CHARACTERIZATION OF CELLULOSE FIBERS AND CELLULOSE NANOCRYSTALS FROM SAGO WASTE

Metroxylon sagu, commonly known as sago palm, is a tropical plant widely grown in Sarawak, Malaysia and it is a major economic asset in the state. Since sago palm has been an economic potential, this leads to abundant waste created from the high production. Thus, in order to utilize this waste, this study highlights the extraction and characterization of cellulose fibers (CFs) and cellulose nanocrystals (CNCs) from sago waste. The objectives of this study are to extract cellulose fibers and cellulose nanocrystals using alkali treatment, bleaching treatment and acid hydrolysis. Characterization of the raw sample and cellulose fibers was conducted using compound light microscope, scanning electron microscope (SEM) and attenuated total reflectance – Fourier transmission infrared spectroscopy (ATR-FTIR). After sequence of chemical treatments, both cellulose fibers and cellulose nanocrystals were successfully extracted with the percentage yield of 11.23%. This research used compound light microscope to visualise the differences in structures of raw sago waste, alkali treated, bleached and acid hydrolysed samples. SEM analysis showed the changes in morphological surfaces on raw sago waste, alkali treated, and bleached samples, which initially had smooth surfaces, and finally became rough due to the densely arranged bundle-like structure fibers that were disintegrated into long, rod-shaped fibrous components after it underwent various chemical treatments due to removal of impurities and non-cellulosic components such as starch, hemicellulose, and lignin. In addition, the structure and composition of cellulose fibers and cellulose nanocrystals were observed in FTIR analysis, and this analysis had proven that the shoulder peak at 1700 cm^{-1}, which belongs to C=O observed in the raw sago waste had disappeared after several chemical treatments, indicating that the hemicellulose and lignin were effectively removed upon applying chemical treatments. These cellulose fibers and cellulose nanocrystals have potentials in reducing the reliance on non-renewable resources and provide a sustainable alternative for the manufacturing of biodegradable materials.