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Characterisation of nanocelluloses from banana pseudo-stem as biomaterial in biodegradable food packaging

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Banana pseudo-stem is one of the promising sources of nanocelluloses for biodegradable food packaging. This banana pseudo-stem is the largest part of a banana plant and it is considered as an agricultural waste since farmers cut it down when they harvest the fruits. In this research, nanocelluloses from banana pseudo-stem were extracted and characterised for further application as a biodegradable food packaging material. Nanocelluloses were extracted through chemical reactions, which included bleaching and oxidation reactions, and mechanical disintegrations. The properties of nanocelluloses from inner and outer layers of banana pseudo-stem and from single and double bleaching were characterised and compared. Celluloses from outer layer had slightly higher crystallinity index (CI) than the inner layer, which was approximately 36.5% for inner and 43.9% for outer parts. Extraction of nanocelluloses increased the CI by almost twice and double bleached nanocelluloses had CI slightly higher than single bleached nanocelluloses. Increase in crystalline proportion of the nanocelluloses was also observed from the endotherm peak from differential scanning calorimetry. Water flow temperatures of nanocelluloses were lower than the raw pseudo-stem flour. From the thermo gravimetric analysis, nanocelluloses seemed to degrade at around 224°C, while the raw banana pseudo-stem degraded at 232°C for inner and 261°C for outer part. This low degradation temperature was expected since the nanocelluloses had diameter much smaller (6-27 nm) than the raw banana pseudo stem flour (>50 µm).

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