

Preparation of Cellulose Pulp from Empty Fruit Bunches of Oil Palm

As a source of both edible and industrial oils, oil palm is one of the most important tree species in Southeast Asian countries like Malaysia. However, woody fibrous residues, which remain after oil is extracted, have not been effectively utilized so far. These so-called empty fruit bunches (EFB, Photo) could serve as an alternative source for cellulose pulp, (dissolving pulp, DP) which could be used as a raw material of cellulose derivatives and regenerated cellulose.

We developed a new method of preparing DP from EFB by using environmentally friendly chemicals. EFB fibers were first hydrolyzed with dilute sulfuric acid (pre-hydrolysis). For the pulping process, a non-sulfur chemical soda-anthraquinone (AQ) was used to avoid water pollution. Ozone (O₃) bleaching was then carried out on the pulp at room temperature with or without alkali extraction afterward. O₃ is a powerful and less-polluting reagent in pulp bleaching and has the potential to replace chlorine-containing reagents commonly used in bleaching processes. For the new method, content of α-D-glucopyranan (an indicator of cellulose purity) reached above 90% for the pre-hydrolyzed pulps by methods A and B in Table. It was an acceptable level as compared with the commercial DP. Ash and pentosan contents of the pulps, which were indicators for cellulose impurity, also remained at comparable levels. The higher α-D-glucopyranan content in the pulp by method A was indicative of the effectiveness of alkali extraction after O₃ treatment in this method in comparison with the pulp by method B. Above all, it was concluded that EFB has a significant potential as a raw material to be utilized for dissolving pulp in an environmentally-friendly manner.

References

Ryohei Tanaka *et al.* 2002. Preparation of cellulose pulp from oil palm empty fruit bunches (EFB) by processes including pre-hydrolysis and ozone bleaching. Proceedings of USM-JIRCAS Joint International Symposium - Lignocellulose - Material of the Millennium: Technology and Application, Penang, Malaysia, Universiti Sains Malaysia.

Ryohei Tanaka *et al.* 2000. Preliminary studies on preparation



Photo. An empty fruit bunch (EFB, top) and its fibrous form (bottom).

of dissolving pulp from oil palm empty fruit bunches. Proceedings of 5th Pacific Rim Bio-Based Composites Symposium, Australian National University.

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Table. Chemical properties of EFB pulps

Preparation and pulping process	α-D-glucopyranan content (%)	Ash content (%)	Pentosan content (%)
[Method A] Pre-hydrolysis pulping ozone alkali extraction	95.1	0.09	1.8
[Method B] Pre-hydrolysis pulping ozone	88.6	0.06	1.8
[Method C] Pulping ozone	77.9	0.12	24.2
Commercial softwood DP	92.3	0.14	2.5