MICROCRYSTALLINE CELLULOSE FROM OIL PALM FIBRES

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It is estimated that about 19.03 million tonnes (wet weight) of empty fruit bunches (EFB) were generated in the year 2007 in Malaysia (Astimar *et al.*, 2008), and efforts to convert this material into value-added products have been carried out. One of these is to extract the high value lignocellulosic materials such as hemicellulose, cellulose and lignin, contents of which are estimated at 22%-25%, 40%-43% and 19%-21% (Abdul Azis Ariffin *et al.*, 1989; Rosnah *et al.*, 2002), respectively, in the dry EFB. The most significant material is cellulose, which has a variety of potential applications in the chemical, food and composite industries.

Cellulose is a naturally occurring polymer in plants and it is comprised of glucose units joined together by β-1,4-glycosidic bonds. The linear cellulose chains are bundled together as microfibrils, and these microfibrils are composed of crystalline regions that exhibit strong internal bonding and amorphous regions with weaker internal bonding. We offer a technology to produce microcrystalline cellulose (MCC) via chemical treatment for the removal of the amorphous part of the cellulose. The amorphous region is removed by acid hydrolysis and the remaining product is MCC.

FIELDS OF APPLICATIONS

MCC has many applications in pharmaceuticals, nutraceuticals, foods, paper and structural composites. For pharmaceutical uses, it is used as a binding agent (due to its compression properties) and also as a disintegrating agent. MCC is also a naturally derived stabilizer, texturizing agent and a fat substitute.

THE PROCESS

Basically the process for producing MCC involves preparation of holocellulose (~ 75%) and α-cellulose (~ 37%) from the EFB fibres. From the α-cellulose, the amorphous cellulose is removed via acid hydrolysis to get the final product, *i.e.* MCC (*Figure 1*). The duration of hydrolysis will determine the quality of the MCC as determined by Fourier Transformed Infrared Spectroscopy (FTIR) analysis (*Figure 2*). The typical characteristics of the MCC are shown in *Table 1*.

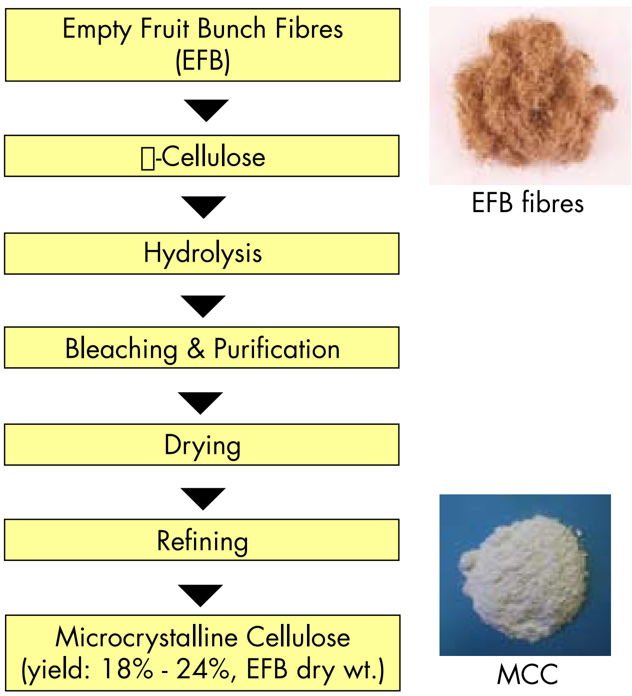

Figure 1. Flow chart of the preparation of MCC.

CONCLUSION

In view of the fact that MCC has a wide range of applications in various industries, the production of palm-based MCC has great potential as a high value and specialty product.

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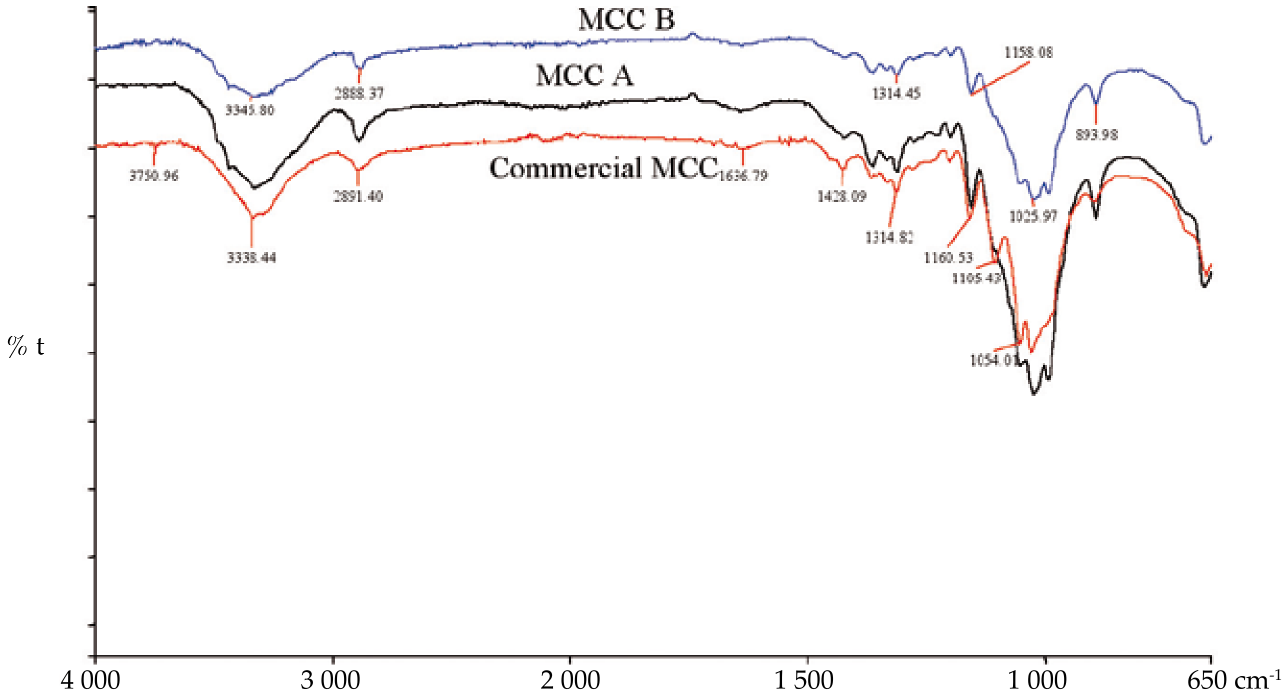

Figure 2. Infrared spectra of MCC A, MCC B and commercial MCC.

Notes: MCC A was from 1 hr of acid hydrolysis.
MCC B was from 3 hr of acid hydrolysis.

TABLE 1. TYPICAL CHARACTERISTICS OF MCC FROM EFB FIBRES

Characteristics	white, odourless and tasteless; insoluble in water, acetone, ethanol and toluene
Water-soluble substances	0.1%-0.4%
pH	6.5 - 7.3
Mesh size	63 - 106 µm
Ash content	0.2%-0.4%
Yield	18%-24% (dry weight)

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