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Mechanical properties and microstructure of metroxylon sago fiber treated by sodium hydroxide

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Abstract

The present study is to investigate natural fiber from metroxylon sago (MS) tree located in thick outer woody rind. The investigation was focused on measuring the mechanical properties and on observation microstructure of MS fibers before and after treatment with 5% sodium hydroxide. Scanning electron microscope was used in observing the microstructure of fiber. The results showed that there was decrease of fiber diameter after mercerization. A porous structure in cross-section area of untreated fibers was clearly seen and it was highly compressed after mercerization. The strength of MS fiber increased significantly after it was treated by 5% NaOH solution for 2 hours. The average ultimate strength of untreated MS fiber was only recorded by 46 MPa and it enhanced significantly to be 163 MPa after treating with sodium hydroxide. Meanwhile, the elastic modulus of treated fibers increased compared to that of untreated fiber.

Key words: *Fibers (B), Mechanical (E), Microstructure (F)*

1. Introduction

Many metroxylon sago plants grow well in tropical country such as in Indonesia. As reported by Singhal *et al*., (2008) that wild sago palm area rough estimated in Indonesia was more than 7 million ha distributed in island of Sumatera, Irian Jaya and Kalimantan. Sago palm is a species of the genus metroxylon belonging to the Palmae family. Sago reaches a maximum height of 25 m and a diameter of 40 cm. The main useful section of the sago palm tree is of the trunk in which starch can accumulate until the flowering stage. The sago starch has been applied in various food products like sago meal, noodles, biscuits and dessert (Singhal *et al*., 2008). Additionally, its use can be applied to produce adhesive material for paper, textile and plywood. Starch in sago trunk is generally obtained from extraction of the pith that was enclosed by around 50 mm thick outer woody rind that is lit lengthways and soft pith separated using a sharpened knife. Then, the woody rind becomes usually a waste and abundant material in which more fibers were still found and stuck well in such waste bark. Therefore, it is very interesting to research the sago palm fiber lies in the woody rind to become a useful material such as fibers which can be used for reinforcement of a natural fiber composite. Many investigations have been conducted to the sago palm and only in majority focused on research the sago starch (Karim *et al*., 2008; Nawang *et al*., 2001; Sopade and Kiaka, 2001). Karim *et al*., (2008) has reported the effects of alkali on sago

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