UNIVERSITI TEKNOLOGI MARA

PROPERTIES OF PARTICLEBOARD FROM OIL PALM TRUNK

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ABSTRACT

This study was conducted on the Oil Palm (*Elaeis guineensiss*) to determine its basic properties and its suitability as a raw material for the manufacture of single layer particleboard. The basic properties determined were based on the TAPPI Standards and the manufacture of particleboard was conducted following the Japanese Industrial Standard JIS. Oil palm trunk used in the study was supplied by Malaysian Palm Oil Board (MPOB), Bangi. Two palms were used for chemical and physical analysis. The average of stem heights was 11.2m. Disks of 20 mm thick were obtained from the three height portion (bottom, middle and top). Samples from each disc were divided into three zones namely near bark, middle, and near pith. Bottom portion of the oil palm trunk had the highest mean density (0.47 g/cm^3) and the lowest mean initial moisture content (134%). Portion and distance from the pith significantly affects the oven-dry density and initial moisture content (MC). Height portion showed significant effect on the cold water, hot water, alkali soluble and ash content. The highest cold water (26.53%), hot water soluble (28.04%), and alkali soluble (39.24%) were observed in the top portion and bottom portion for ash content (2.73%) with positive correlation with height portion. The lignin and holocellulose content were insignificantly affected by the height portion. In the manufacture of single layer particleboard, after bark removal, the trunk was further processed into small blocks with a chainsaw and fed through the disc flaker to produce particles. The particles were then air-dried for two days to reduce the moisture content and oven-dried for another 48 hours for a MC of about 5% then screened into sizes (unscreened, 1.0 mm and 2.0 mm). Single layer of oil palm boards were produced using urea formaldehyde as binder. The particles were sprayed with 8, 10 & 12% resin content. One % of wax content was also added. The oil palm board was hot-pressed at 165^{0}C for 6 minutes. Results on the properties of the board showed that all the main factors of particle size, density, resin and wax content showed significant effects on all the board properties. Increase in particle sizes significantly improved the physical and mechanical properties (except for IB). All the mechanical and physical properties were improved significantly with increasing resin content. Wax addition significantly improved the dimensional stability but reduced the mechanical properties. The mechanical and physical properties were shown to be significantly affected by an increased in the board density. From this study, the physical and chemical properties of oil palm trunk particle do not affect on the particleboard properties. In general, unscreened particles with 700 kg/m^3 in density were suitable for particleboard and able to meet the JIS A 5908:2003 except for dimensional stability. The thickness swelling value for all the boards exceeded the 12% maximum requirement.

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Introduction

Background

Malaysia produces more than 100 million tonnes of oil palm biomass annually in the form of the oil palm trunks (OPT), oil palm fronds (OPF) and empty fruit bunch (EFB). Wood waste has excellent physical and mechanical properties and can be used in producing composite products for various end uses (Anonymous, 2008a). The wood-based industry in Malaysia is predominantly owned by Malaysian, and it is estimated that 80% of timber-based companies are small and medium-size companies (MIDA, 2009).

The wood processing industry has recently experienced shortages in rubberwood supply (Anonymous, 2009c). Due to the impending shortage of rubberwood, the Malaysian wood based industry to seek other alternative lignocellulosic raw materials for board production. One such alternative is the agricultural residue. The oil palm (*Elaeis guineensis*) trunks appear to have been a great potential after rubberwood (*Hevea brasiliensis*) as they are available in enormous quantities during the replanting process (Liew and Razali, 1994).

According to Rahim Sudin et al. (1993), the price of rubberwood is becoming more competitive due to high demand and decreasing areas planted with rubber (Table1.1). Therefore, an alternative lignocellulosic resource is required to supply the wood composite industries in this country. The oil palm residue is abundantly available to be used commercially in this country.