UNIVERSITI TEKNOLOGI MARA

CHARACTERISATION AND PROPERTIES OF OIL PALM FRUIT BUNCH (OPFB)/ POLYPROPYLENE (PP) COMPOSITES, PP NANOCLAY/PP AND OPFB/PP NANOCLAY/PP HYBRID COMPOSITES

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Thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

Faculty of Mechanical Engineering

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Candidate's Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of University Teknologi MARA. It is original and is the result of my own work unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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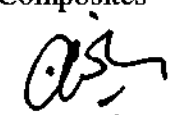
Signature of Candidate	
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ABSTRACT

In this study the oil palm fruit bunch fibres were used as the filler or reinforcement in polypropylene. Thus the aim of this thesis was to achieve a greater understanding of the various parameters that contribute to the variations of water absorption, thermal stability and mechanical properties, and to manipulate these parameters in order to produce an improved oil palm fruit bunch fibre reinforced polypropylene composite material. Several characterization techniques, such as tensile test, flexural test, impact test, water absorption analysis, thermal analysis and chemical analysis were used to assess the effect of each parameter. OPFB/PP composites at four different sizes of 250 μm, 180 μm, 125 μm and 100 μm were investigated on the water uptake ability and were found to increase as the OPFB size increase. Meanwhile the thermal stability decrease at temperature range of 200°C - 450 °C. The investigations also showed that the tensile and flexural properties were increased with the increasing of OPFB size and indicated that the 250 μm OPFB/PP composites had the most enhances mechanical properties. PPnanoclay/PP composites were compounded at four PPnanoclay loadings of 10 phr, 25 phr, 40 phr and 100 phr. The water uptake of PPnanoclay/PP composites was found to increase as the PPnanoclay loading increase followed by the increase in thermal stability as well. Tensile tests, flexural tests and impact tests revealed that the optimum composite consisted of polypropylene with 25 phr PPnanoclay loading. Combination of OPFB and PPnanoclay as fillers in PP indicates that the tensile modulus, flexural modulus and flexural strength has increased at lower PPnanoclay loading and decreased at higher PPnanoclay loading. The optimum loading of PPnanoclay in OPFB/PPnnoclay/PP hybrid composites was also found to be at 25 phr. Further investigation on the effects of OPFB size in OPFB/PPnnoclay/PP hybrid composites showed that the 250 μm size gave the most mechanical properties enhancement. Properties improvement after OPFB treatment and increase of MAPP loading with the increase of OPFB loading suggested that the good bonding between filler and matrix contributed to the mechanical properties enhancement, decrease of water uptake and increase of thermal stability.

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