UNIVERSITI TEKNOLOGI MARA

PHYSICAL, MECHANICAL AND MORPHOLOGICAL STUDIES OF UNSATURATED POLYESTER MATRIX AND KENAF SHORT FIBRES IN COMPOSITE SYSTEM

MUHAMMAD MUSTAKIM MOHD GHAZTAR

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ABSTRACT

The fibres physical, mechanical and microstructural properties are crucial elements in the fabrication of biocomposites. The research was conducted based on lack of attention in materials preparation and fabrication processes especially, using short natural fibres and thermosetting matrix system. Thus, the objective of this research is to optimise the materials preparation and fabrication processes in an effort to identify the cause of biocomposite strength inconsistency. The research was carried out by fabricating the samples into two (2) types of fibres categories and fibres loadings and tested to determine its physical, mechanical and morphological properties. The samples were analysed microscopically before, and after the test to identify the cause of fibres-matrix de-bonding. The results showed that the density and hydrophilicity properties of the composite increases as the fibres content increases, however, the hardness properties decrease as the matrix content decreases. In addition, the treated samples gave the highest tensile (44.28 N/mm^2) and flexural (49.57 N/mm^2) strength, especially low A-fibres loading samples (46.89 N/mm^2). Moreover, in morphological analysis of samples fractured surface, showed identical fibres pre-damage imparted to the fibres pull-out. The application of chemical treatments coalition contributes well in the improvement of physical and mechanical properties of the composite. But, due to the less treated fibres surface contact, the damaged fibres retained its shapes. It reduced fibres-matrix interaction and creates stress discontinuity during testing process. As a conclusion, by better understanding the natural based composite behaviour, the suitable optimisation methods can be implemented. In the end, the cause of natural based composite strength inconsistency can be resolved in future.

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