

EFFECTS OF WOOD CONTENT ON THE COLOR,
MECHANICAL PROPERTIES, SURFACE
CHEMISTRY AND MORPHOLOGY
OF WOOD-PLASTIC COMPOSITE

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**EFFECTS OF WOOD CONTENT ON THE COLOR, MECHANICAL
PROPERTIES, SURFACE CHEMISTRY AND MORPHOLOGY
OF WOOD-PLASTIC COMPOSITE**

**By
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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: **Effects of Wood Content on the Color, Mechanical Properties, Surface Chemistry and Morphology of Wood-Plastic Composite** oleh **Kwa Bee Kee**, no. matrik: **UK13269** telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Fizik sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains Gunaan (Fizik Elektronik & Instrumentasi), Fakulti Sains dan Teknologi, UMT.

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DECLARATION

I hereby declare that this thesis entitled Effects of Wood Content on the Color, Mechanical Properties, Surface Chemistry and Morphology of Wood-Plastic Composite is the result of my own research except as cited in the references.

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ABSTRACT

Effects of wood content on the color, mechanical properties, surface chemistry and morphological of wood-plastic composite (WPC) based on different mixture ratios of recycled high density polyethylene (rHDPE) and wood flour were investigated. Color measurement, FTIR analysis, mechanical testing and scanning electron microscopy study had employed in this research. The addition of wood flour indicated an increased of total color change and a decreased of lightness. The resulting WPC became darken and the colors were toward to red and yellow if compared with initial value. Functional groups of wood flour in rHDPE matrix can be seen clearer with increasing wood flour content as the shape of the wavenumber determined by FTIR spectroscopy became so obvious to be observed. As an overall, modulus of elasticity was improved by the addition of wood flour, whereas stress at break, strain at break and elongation at break were lowered by the addition of wood flour. Resulting WPC experienced a negative effect on the mechanical properties due to poor interfacial bonding between the polymer matrix and wood flour filler. Unidentified particles with vertex were found in rHDPE due to the impurity of rHDPE as a recycled material. Holes were made by fibres being pulled out from the polymer matrix. Fibre breaking and region of cup-and-cone fracture were examined in the fractured polymer matrix. Gaps between the matrix and fibre were getting visible with increasing wood flour content. This shows that the interaction between matrix and filler was weak, resulting in less and poor interfacial adhesion with an addition of wood flour.

KESAN KANDUNGAN KAYU TERHADAP WARNA, CIRI-CIRI MEKANIKAL, PERMUKAAN KIMIA DAN MOFOLOGI DALAM KOMPOSIT KAYU-POLIMER

ABSTRAK

Kesan kandungan kayu terhadap warna, ciri-ciri mekanikal, permukaan kimia dan morfologi dalam komposit kayu-polimer (WPC) berdasar nisbah campuran yang berbeza dalam polietena ketumpatan tinggi kitar semula (rHDPE) dan serbuk kayu telah kaji dalam penyelidikan ini. Dalam kajian ini, ujian warna, FTIR, terikan dan imbasan imej menggunakan mikroskop pengimbasan elektron (SEM) telah dilakukan. Penambahan serbuk kayu menyebabkan peningkatan kepada jumlah perubahan warna dan penurunan kepada kecerahan dalam sampel kajian. Warna sampel kajian menjadi semakin gelap dan lebih kepada warna merah dan kuning berbanding dengan nilai awal. Kumpulan berfungsi serbuk kayu dalam matrik rHDPE dapat dilihat lebih jelas dengan penambahan serbuk kayu disebabkan oleh peningkatan puncak dalam graf bagi ujian FTIR. Secara kesimpulan, modulus kekenyalan telah dipertingkatkan dengan penambahan serbuk kayu, manakala tekanan pada pemutusan, terikan pada pemutusan dan pemanjangan pada pemutusan mengalami penurunan dengan penambahan serbuk kayu. Sampel kajian mengalami satu kesan negatif dalam ciri-ciri mekanikal kerana ikatan lemah di antara matrik polimer dan pengisi serbuk kayu. Partikel yang tidak diketahui yang mempunyai bucu yang bersegi telah dikesan dalam rHDPE disebabkan ketidaktulenan rHDPE yang merupakan bahan kitar semula. Penghasilan lubang-lubang disebabkan oleh gentian ditarik keluar dari matrik polimer semasa ujian terikan. Pemutusan gentian dan retakan “cup-and-cone” dikesan dalam matriks sepanjang kawasan putus bagi sampel. Celahan di antara matrik dan gentian semakin mudah dilihat dengan penambahan serbuk kayu. Ini menunjukkan bahawa interaksi antara matriks dan pengisi adalah lemah. Ini mengakibatkan lekatan menjadi kurang dan lemah dengan penambahan serbuk kayu.