

EFFECTS OF DENSITY OF SAGO/UREA FORMALDEHYDE PARTICLEBOARD TOWARDS ITS THERMAL STABILITY, MECHANICAL AND PHYSICAL PROPERTIES

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Graphical abstract



Abstract

This study examined the effect of density on the thermal stability, physical and mechanical properties of sago particleboard. Sago particles and Urea Formaldehyde (UF) were used as raw materials in the fabrication process. The fabrication and testing method were based on JIS A 5908 standard. The samples were prepared based on different desired density and went through a series of thermal stability, mechanical and physical tests. Mechanical properties of the composites were characterized by tensile, flexural, impact strength, screw test and internal bonding which had great influence on the particleboard performance. All the panels were tested for physical properties (water absorption and thickness swelling) to identify their use for indoor application. Thermal properties like thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) for the Sago/UF composites were analysed. The results showed particleboard with 800 kg/m³ exhibited the optimum strength on Internal Bonding, Screw test, Bending and Flexure test. Particleboard with 700 kg/m³ has better performance on Impact test. 500 kg/m³ showed better curing properties with DSC. TGA showed that all the Sago/UF particleboard decompose with single-stage and were decomposed into three main steps like water absorption, volatile and char.

Keywords: Sago particleboard, Urea Formaldehyde, natural fibres, thermal stability, mechanical and physical test

Abstrak

Kajian ini dijalankan bagi mengkaji kesan ketumpatan papan partikel sago terhadap kestabilan haba dan sifat-sifat fizikal serta mekanikal. Partikel sago dan Urea Formaldehid (UF) digunakan sebagai bahan mentah dalam proses pembuatan papan tersebut. Kaedah pembuatan dan ujian yang digunakan adalah berdasarkan piawaian JIS A 5908. Beberapa sample telah dijalankan ujian kestabilan haba, ujian mekanikal and fizikal berdasarkan ketumpatan masing-masing. Sifat-sifat mekanikal komposit dikategorikan sebagai tegangan, lenturan, kekuatan nimpak, ujian skru dan ikatan dalaman yang mempunyai pengaruh yang besar terhadap prestasi papan partikel. Di samping itu, bagi sifat fizikal (penyerapan air dan ketebalan kembangan), semua panel telah diujikaji untuk mengenalpasti kegunaan dalam ruang tertutup. Sifat haba seperti Analisis Termogravimetrik (TGA) dan Differential Scanning Calorimetry (DSC) bagi komposit Sago/UF telah dianalisis. Papan partikel dengan ketumpatan 800 kg/m³ menunjukkan kekuatan optimum dari segi ikatan dalaman, ujian skru dan ujian lenturan. Papan partikel berketumpatan 700 kg/m³ mempunyai prestasi paling bagus dalam ujian impak. Papan partikel berketumpatan 500 kg/m³ pula menunjukkan sifat kestabilan yang lebih baik pada DSC. TGA menunjukkan kesemua papan partikel Sago/UF mengalami