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ABSTRACT

Palm kernel oil was used as a raw material for the synthesis of polyester polyol. The palm oil based polyester polyol was synthesized using glycerol, phthalic anhydride and fumaric acid. Palm oil based polyester polyol combines with methylene diphenyl diisocyanate (MDI) to form the polyurethane binder. The fibers are derived from empty fruit bunch (EFB) of the palm tree and have the acceptable mechanical properties. In this project, palm fibers were converted into palm fiberboards by using polyurethane (PU) binder under specified pressure and temperature. The binder to fiber ratio was varied from 10% to 30 % by dried weight of the palm fiber. The curing temperature was set from 60°C to 100°C and curing pressure was between 3 MPa to 7 MPa. The curing time was from 5 to 25 minutes. The density, tensile strength, modulus of elasticity, flexural strength, impact strength, water absorption and swelling of fiberboards were determined. Increase of the PU binder content and the NCO/OH ratio would significantly improve the mechanical properties of the fiberboards. The fiberboards made from fine fiber had better mechanical properties than those made from palm fiber mat, which comprise mainly of longer fibers.

ABSTRAK

Minyak isi keras kelapa sawit digunakan untuk mensintesiskan poliester poliol. Poliester poliol yang berdasarkan minyak kelapa sawit disintesiskan dengan menggunakan gliserol, ftalik anhidrida dan asid fumarik. Poliester poliol bergabung dengan MDI menjadi pengikat poliuretana. Serabut kelapa sawit berasal daripada isi batang pokok minyak kelapa sawit dan mempunyai sifat-sifat mekanik yang sesuai. Dalam projek ini, serabut kelapa sawit telah ditukarkan menjadi papan nipis dengan menggunakan pengikat poliuretana (PU) pada suhu dan tekanan yang tertentu. Nisbah pengikat poliuretana kepada serabut kelapa sawit adalah daripada 10% hingga 30% mengikut berat kering serabut kelapa sawit. Suhu pematangan telah ditetapkan daripada 60°C hingga 100°C dan tekanan pematangan dalam linkungan 3 MPa hingga 7 MPa. Masa pematangan dari 5 minit hingga 25 minit. Ketumpatan, kekuatan ketegangan, kekuatan keanjalan, kekuatan *flexural*, kekuatan hentaman dan penyerapan air bagi papan nipis telah ditentukan. Peningkatan kandungan pengikat poliuretana dan nisbah NCO/OH akan memperbaiki sifat-sifat mekanik papan nipis dengan nyata. Papan nipis yang diperbuat daripada serabut kelapa sawit yang pendek mempunyai sifat-sifat mekanik yang lebih baik daripada papan yang diperbuat daripada serabut kelapa sawit yang lebih panjang.

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LIST OF SYMBOYLS AND ABBREVIATIONS

ASTM	American Society for Testing Materials
EFB	Empty fruit Bunch
FTIR	Fourier Transform Infrared
GPa	Giga Pascal
GPC	Gel Permeation Chromatography
HDF	High Density Fiberboard
HMDI	Hexamethylene Diisocyanate
MDF	Medium Density Fiberboard
MDI	Diphenylmethane-4,4-Diisocyanate
MOE	Modulus of Elasticity
MPa	Mega Pascal
M_n	Number Average Molecular Weight
M_w	Weight Average Molecular Weight
OSB	Oriented Strand Board
PMDI	Polymeric Diphenylmethane-4,4-Diisocyanate
TDI	Toluene Diisocyanate
TGA	Thermogravimetric Analysis
PU	Polyurethane