PROPERTIES OF CHEMICALLY MODIFIED *ALPINIA GALANGA* FILLED HDPE COMPOSITES

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Thesis Submitted in Fulfillment of the Requirements for the Degree of Master of Science in the School ofOcean Engineering
Universiti Malaysia Terengganu
May2014

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirements for the degree of Master of Science

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May2014

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In recent years, many studies have focused on the idea of using natural fibers from renewable resources as alternative to replace traditional synthetic fibers in polymer composite systems. This is due to the increased ecological concern and environmental awareness. In this study, the effect of untreated and sodium hydroxide (NaOH), 3-aminopropyltriethoxysilane (3-APE) as well as p-toluenesulfonic acid (PTSA) treated *Alpiniagalanga* (AG) agricultural residue-HDPE composites with and without addition of maleic anhydride-graft-polyethylene (MAPE) and eco degradant (ECO) were studied. The composites were prepared by melt blending HDPE resin with various AG fiber loadings (3, 6, 10 and 15 wt%) by using a BrabenderPlastograph EC mixer at 135°C at 50 rpm. The composites were characterized based on tensile properties, morphology, thermal properties and water absorption. The finding reveals that AG fibers generally reinforced AG/HDPE composites with increasing AG fiber loadings. Four formulations of AG/HDPE show a significant improvement in tensile strength. Tensile strength of NaOH and 3-APE treated AG fibers/HDPE composites with an addition of ECO (AG/HDPE+ECO) is 34.7 MPa, which is 24.9 % higher than that of pristine HDPE (27.8 MPa). The addition of AG fibers improved the Young's modulus of AG/HDPE composites with addition of ECO up to 4874.2 MPa as compared to HDPE (1012.7 MPa). However, the elongation at break of AG/HDPE is generally lowered with the inclusion of AG fibers. The treatment of AG fibers with NaOH and 3-APE and inclusion of ECO resulted in 0.4 % water absorption than that of HDPE(0.1%). The presence of treated AG fibersshowed higher the thermal stability of AG/HDPE composites compared to untreated AG/HDPE composites. Thetensile fracture surfaced morphology of AG/HDPE composites and Fourier transform infrared spectroscopy(FTIR) analysis of untreated and treated AG/HDPE composites with and without addition of ECO and MAPE support the above analysis.

Abstraktesis yang dikemukakankepadaSenatUniversiti Malaysia Terengganu
sebagaimemenuhikeperluanuntukIjazahSarjanaSains

SIFAT-SIFAT KOMPOSIT HDPE TERISI ALPINIA GALANGA TERAWAT

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PusatPengajian : KejuruteraanKelautan

Sejaktahunkebelakanganini, banyakkajiantelahmemberitumpuankepada idea menggunakan gentian aslidarisumber yang bolehdiperbaharuisebagaialternatifuntukmenggantikanseratsintetiktradisionaldalamsiste mkompositpolimer.Iniadalahkeranakebimbanganekologi yang meningkatdankesedaranalamsekitar.Dalamkajianini, kesan yang tidakdirawatdannatriumhidroksida (NaOH), 3-aminopropiltrietoksisilana (3-APE) danjugaasidp-toluenesulfonik(PTSA) dirawat*Alpiniagalanga* (AG) pertaniankompositsisa-HDPE dengandantanpapenambahan maleic anhidrida-cangkukan-polietilena (MAPE) danekorosotan (EKO) telahdisiasat.Kompositinidisediakandenganmencairmengadun resin HDPE denganpelbagaibebananserat AG (3, 6 , 10 da n 15 % berat) denganmenggunakanpengadunBrabenderPlastograph EC pada 135 ° C pada 50 rpm.Penciriankompositadalahberdasarkansifat-sifattegangan, morfologi, sifathabadanpenyerapan air.Dapatankajianmenunjukkanbahawaserat AG umumnyamengukuhkankomposit AG/HDPE denganpeningkatan AG bebananserat.Empatformulasi AG/HDPE menunjukkanpeningkatan yang ketaradalamkekuatantegangan.KekuatanteganganNaOHdan 3-APE dirawatkompositserat AG/HDPE dengantambahansebanyak ECO (AG/HDPE+EKO) adalahkira-kira 34.7 M Pa, iaitu 24.9% lebihtinggidaripada HDPE asli (27.8 MPa). Penambahanserat AG meningkatkan modulus Young komposit AG/HDPE denganpenambahanEKO sehingga 4874.2 MPaberbandingdenganHDPE (1012.7 MPa).Walaubagaimanapun, pemanjangantakatputus AG/HDPE umumnyamenurundengankemasukan gentian AG.Rawatan gentian AG denganNaOHdan 3-APE dankemasukan EKO menyebabkan 0.4% penyerapan air berbanding HDPE (0.1 %).Kehadiranserat AG terawatmenunjukkantinggikestabilantermakomposit AG/HDPEberbandingdengankomposittidakterawat AG/HDPE.Morfologipermukaanpatahkomposit AG/HDPE dananalisisSpektroskopiInframerahTransformasiFourier (FTIR) kompositAG/HDPE