

INTISARI

Material gabungan antara serat sintetis dan serat alami yang biasa disebut komposit *hybrid* telah banyak diminati oleh para ahli untuk dikembangkan dan diteliti karena material komposit memiliki kekuatan yang tinggi, mudah dibentuk, tahan korosi dan harganya lebih murah dibandingkan material logam. Pemanfaatan material komposit telah banyak diaplikasikan dalam kehidupan manusia, termasuk dalam dunia industri material komposit digunakan sebagai pengganti logam. Tujuan dari penelitian ini yaitu membuat komposit *hybrid* serat ijuk acak/serat gelas searah bermatriks *polyester* untuk mengetahui pengaruh rasio hibridisasi terhadap ketangguhan impact dan sifat lentur pada balok pendek.

Komposit *hybrid* difabrikasi dengan menggunakan cetakan *cold press* selama 12 jam dengan komposisi matriks/*filler* yaitu 70/30 %. Serat ijuk dialkalisasi dengan cara merendam serat dalam larutan 5% NaOH selama 2 jam, sedangkan proses penetralisasi serat ijuk dilakukan dengan merendam serat dengan *aquades* selama 48 jam dan pergantian air sebanyak 8 kali. Pada penelitian ini dilakukan perbandingan pada lapisan serat gelas yaitu 0 lapis, 1 lapis, 2 lapis dan 8 lapis, serta perbandingan panjang span terhadap tebal komposit yaitu $L/d = 16$ dan $L/d = 24$. Pengujian bending berdasarkan ASTM D790 dan pengujian impact berdasarkan ASTM D4812 dilakukan pada semua spesimen komposit *hybrid*. Pengujian impact dilakukan dari sisi permukaan belakang.

Hasil penelitian menunjukkan bahwa kekuatan bending tertinggi (399,921 MPa) pada variasi lapisan serat gelas 8 lapis panjang $L/d = 16$ dengan regangan 4,34%. Modulus elastisitas tertinggi dicapai pada variasi lapisan serat gelas 8 lapis panjang $L/d = 24$ (9,57 GPa). Hasil pengujian impact menghasilkan nilai ketangguhan impact tertinggi pada variasi lapisan serat gelas 8 lapis (223832,12 J/m²), sehingga dapat disimpulkan bahwa peningkatan volume serat gelas dapat berpengaruh pada nilai kekuatan bending, regangan bending dan modulus elastisitas. Peningkatan volume serat gelas juga dapat mempengaruhi nilai ketangguhan impact.

Kata Kunci : Komposit *hybrid*, serat ijuk, serat gelas, *polyester*, pengujian bending, pengujian impact

ABSTRACT

A combination of synthetic fibers and natural fibers commonly called hybrid composites has been in great demand by experts to be developed and researched because they have high strength, easily shaped, corrosion resistant and cheaper than metals. The use of composite materials has been widely applied in human life, including in the composite material industries. The purpose of this research is to make hybrid composite fibers from random sugar palm fibers / glass fibers / polyester to determine the effect of hybrid ratio on impact toughness and flexural properties on the short beam.

Hybrid composites were fabricated using cold press molds for 12 hours with a matrix / filler composition of 70/30%. Sugar palm fibers were alkalisied by immersing the fiber in a solution of 5% NaOH for 2 hours, while the process of neutralizing the fibers done by soaking the fiber with aquades for 48 hours and changing the water 8 times. In this study the number of the glass fiber layers were 0, 1, 2, 8 and the ratio of the span length to the thickness of the composite were $L/d = 16$ and $L/d = 24$. Bending testing based on ASTM D790 and impact testing based on ASTM D4812 were performed on all hybrid composite specimens. Impact testing is carried out from the glass fiber surface.

The results showed that the highest bending strength (399,921 MPa) was obtained from the 8 glass fiber layer $L/d = 16$ with strain 4.34%. The highest modulus of elasticity is achieved in glass fiber layer variations of 8 layers and $L/d = 24$ (9,57 GPa). The impact test resulted in the highest impact toughness at 8 layers of glass fiber (223832,12 J/m²), so it can be concluded that the increase in the volume of glass fiber can affect the value of bending strength, bending strain and modulus of elasticity. Increasing the volume of glass fiber can also affect the value of impact toughness.

Keywords: Hybrid composite, sugar palm fiber, glass fiber, polyester, bending test, impact test