

INTISARI

Komposit serat alam sisal sebagai bahan penguat/pengisi (*fillers*) dengan matriks *Polymer low density polyethylene* (LDPE) dikembangkan sebagai kandidat bahan aplikasi biomedis. Serat sisal memiliki beberapa keunggulan densitas yang rendah, harga rendah dan biokompatibel bagi tubuh manusia. Tujuan dari penelitian ini yaitu membuat komposit hibrida (LDPE) dengan *fillers* serat sisal/karbon sebagai bahan perangkat biomedis, dan mengetahui metode fabrikasi yang terbaik dari variasi fabrikasi metode lamina, *mixing*, dan *sandwiching*.

Fabrikasi komposit hibrida menggunakan metode lamina, *mixing*, dan *sandwiching* dengan mesin *hot press*, pada temperature 115 °C, dengan tekanan 2,175 MPa selama 2 jam. Serat sisal diperlakukan alkalisasi NaOH konsentrasi 6% selama 36 jam, dan serat sisal dipotong panjang 6 mm. Serat karbon diperlakukan dengan direndam nitrogen cair selama 10 menit, dan serat karbon dipotong panjang 10 mm disusun dengan metode *hand lay-up*. Komposisi matriks/*filler* yaitu 80:20 % dan serat hibrida sisal dan karbon 3:1. Pengujian bending menggunakan standar ASTM D790-03, dan pengujian daya serap air ASTM D570, kemudian karakterisasi struktur patahan uji bending dilakukan menggunakan mikroskop optik makro.

Hasil penelitian menunjukkan bahwa komposit hibrida LDPE/sisal/karbon dengan tegangan bending dan modulus elastisitas tertinggi pada komposit yang di fabrikasi dengan metode Lamina yaitu 24,97 MPa dan 1,900 GPa serta uji *water absorption* dan *thickness swelling* masing-masing sebesar 5,19% dan 3,46%. Dengan demikian variasi metode Lamina lebih baik jika dibandingkan dengan metode *Mixing* dan metode *sandwiching*. Selain itu dari hasil foto makro metode fabrikasi lamina menunjukkan persebaran serat dan matriks paling merata jika dibandingkan dengan metode fabrikasi lainnya.

Kata kunci : LDPE, serat sisal, serat karbon, komposit hibrida, *biomedic. flexural test, water absorption*

ABSTRACT

Sisal natural fiber composites as reinforcement / fillers with matrix Polymer low density polyethylene (LDPE) was developed as a candidate for biomedical application materials. Sisal fiber has several advantages in low density, low price and biocompatible for the human body. The purpose of this study is to make hybrid composites (LDPE) with sisal / carbon fiber fillers as biomedical device materials, and to know the best fabrication methods from variations in fabrication of lamina, mixing and sandwiching methods.

Fabrication of hybrid composites was using the lamina, mixing and sandwiching methods in a hot press machine, at a temperature of 115 °C, and a pressure of 2,175 MPa for 2 hours. Sisal fiber was treated with NaOH of concentration of 6% for 36 hours, and sisal fiber was cut in length of 6 mm. Carbon fiber was treated by soaking in liquid nitrogen for 10 minutes, cut to 10 mm in length arranged using the hand lay-up method. The matrix / filler composition is 80:20% and sisal to carbon hybrid ratio is 3: 1. The bending test uses the ASTM D790-03 standard, and water absorption that standard was ASTM D570, then characterization of the failure structure of the bending test is carried out using a macro optical microscope.

The results showed that the sisal/carbon LDPE hybrids composites with the highest bending stress and modulus of elasticity in composites is being fabricated using the lamina method were 24,97 MPa and 1,900 Gpa respectively, and water absorption and thickness swelling tests were 5.19% and 3.46% respectively, Thus the lamina method is better when compared to the mixing method and the sandwiching method. In addition, from the photo macrographs, the fabrication method of lamina shows the most even distribution of fibers and matrices when compared with the other fabrication methods.

Keywords: LDPE, sisal fiber, carbon fiber, biomedic hybrid composites