

INTISARI

Perkembangan komposit serat alam semakin meningkat setiap tahun dalam berbagai aspek, salah satunya di bidang biomedis. Komposit serat alam semakin meningkat karena serat alam mudah didapatkan, harga murah, mudah di proses, densitas rendah, ramah lingkungan, dan dapat diuraikan secara biologi. Tujuan dari penelitian ini yaitu membuat komposit hibrid LDPE dengan filler serat sisal/karbon dengan variasi perbandingan serat hibrida dan sebagai bahan alternatif untuk perangkat biomedis, serta mengetahui karakteristik sifat fisis water absorption dan sifat mekanis bending pada material komposit hibrida.

Fabrikasi komposit hibrida menggunakan metode lamina serat acak dengan mesin *hot press*, pada temperature 115°C dengan tekanan 1,449 MPa selama 15 menit, serat sisal diberi perlakuan alkalisasi NaOH 6% selama 36 jam di potong 6 mm. Serat karbon diberi perlakuan dengan direndam nitrogen cair selama 10 menit dan dipotong 10 mm disusun dengan metode *hand lay up*. Komposisi matriks/filler yaitu 80:20% dan perbandingan serat hibrida sisal/karbon 3:1, 2:1, dan 1:1. Pengujian bending dengan standar ASTM D790-03 dan pengujian daya serap air dengan standar D570, kemudian karakterisasi struktur moda patahan uji bending dilakukan menggunakan mikroskop optik makro.

Hasil penelitian menunjukkan bahwa komposit hibrid sisal/karbon/LDPE dengan tegangan *bending* dan modulus elastisitas tertinggi ditunjukkan pada komposit dengan variasi perbandingan sisal/karbon 1 : 1 yaitu 26,32 MPa dan 2,128 GPa serta uji *water absorption* dan *thickness swelling* sebesar 4,8% dan 3%. Hasil tersebut juga dapat dijelaskan dari foto makro penampang lintang komposit hasil uji bending yang menunjukkan ikatan serat dan matriks lebih baik daripada variasi perbandingan 3:1 dan 2:1.

Kata kunci : LDPE, serat sisal, serat karbon, komposit hibrid, *flexural strength*, *water absorption*

ABSTRACT

The development of natural fiber composite has been increasing annually in various aspects, for example, in the biomedical field. Natural fiber composite increasing because natural fibers are easily available at low cost, easy to process, low density, environmentally friendly, and can be decomposed biologically. The purpose of this study is to make hybrid low-density polyethylene (LDPE) composites with sisal fiber fillers and carbon fiber as an alternative material for biomedical devices and to know the mechanical properties of bending and physical properties of hybrid water absorption composite materials with variations in sisal and carbon.

Fabrication of hybrid composites was carried out using the random fiber method using an engineered hot press, at a temperature of 115 °C with a pressure of 1.449 MPa for 15 minutes. Sisal fiber fillers were alkaline treated with 6% of NaOH for 36 at in, cut at 6 mm long. The treatment of carbon fiber was carried out by soaking liquid nitrogen for 10 minutes and cut at a length of 10 mm arranged manually using the hand lay-up method. The composition of the composites with matrix/filler ratio at 80/20 wt%, and the ratios of sisal and carbon fibers are 3:1, 2:1 and 1:1. Bending tests was conducted according to the ASTM D790-03 standard, and water absorption test was according to ASTM D570 is carried out on all hybrid composite specimens. Then the characterization of the bending test fault structure is carried out from the side of the cross section using an optical microscope.

The results showed that the sisal/carbon/LDPE hybrid composites with the highest bending strenght and modulus of elasticity were found at the ratio of sisal/carbon 1:1 which was 26.32 MPa and 2.128 GPa, respectively and water absorption and thickness swelling tests of 4.8% and 3%, respectively these results can also be explained from composite cross-sectional photo macro resulting from bending tests that show better fiber matrix bonds than, that at the ratio of 3:1 and 2:1.

Keywords: LDPE, sisal fiber, carbon fiber, hybrid composite, flexural strength, water absorption