

INTISARI

Sisal merupakan serat yang ramah lingkungan, elastis, dan mudah menyerap air. Serat karbon memiliki sifat lebih kuat dari baja tapi jauh lebih ringan. Komposit serat sisal dan karbon saat ini banyak diteliti untuk aplikasi biomedis. Maka pada penelitian ini dilakukan modifikasi dengan mencampurkan serat sisal dan karbon untuk meningkatkan sifat mekanisnya. Tujuan penelitian ini adalah untuk mengetahui pengaruh jenis matriks *polyester*, *epoxy*, dan PMMA terhadap sifat bending dan *water absorption* pada komposit hibrid berpenguat serat sisal dan karbon. Kemudian mengetahui apakah komposit hibrid tersebut mengalami penurunan kuat bending setelah perendaman.

Sebelum pembuatan komposit, serat sisal diberi perlakuan alkalisasi dengan larutan 6% NaOH selama 36 jam. Sedangkan serat karbon direndam dalam nitrogen cair (N₂) selama 10 menit. Serat sisal dan karbon masing-masing dipotong sepanjang 6 mm dan 15 mm. Komposit dibuat dengan teknik *cold press*, dengan fraksi volume serat sisal dan karbon masing-masing 15% dan matriks 70%, kemudian dicetak selama 1-8 jam. Uji bending dan *water absorption* yang masing-masing mengacu pada ASTM D790M dan ASTM D570 dilakukan pada semua spesimen komposit. Selain itu, pada penelitian ini uji bending dilakukan sebelum dan sesudah spesimen direndam dalam air selama 216 jam (*water absorption*). Ketebalan dan berat spesimen uji *water absorption* diukur setiap 12 jam sekali. Hasil patahan pengujian bending dikarakterisasi menggunakan mikroskop optik.

Hasil penelitian menunjukkan bahwa komposit bermatriks PMMA memperoleh kekuatan bending paling tinggi, baik sebelum maupun sesudah perendaman yaitu $\pm 150,33$ MPa, sedangkan komposit bermatriks *epoxy* dan *polyester* masing-masing mengalami penurunan kuat bending sebelum dan sesudah perendaman, yaitu 0,46% dan 0,13%. Nilai kuat bending tersebut terkait dengan perbedaan hasil uji *water absorption*, dimana pada komposit bermatriks PMMA menunjukkan nilai pertambahan tebal dan berat terendah, masing-masing yaitu 1,99% dan 1,64%.

Kata Kunci : Sisal, Karbon, Bending, Epoxy, Polyester, PMMA

ABSTRAK

Sisal is fiber which is environmentally friendly, elastic, and able to absorb water easily. Carbon fiber has stronger characteristic than steel, but is way to light. Today, the composite sisal and carbon fiber is often studied for biomedical applications. So, this research conducted modification by mixing sisal and carbon fiber to improve the mechanical characteristic. The objective of the research is to find out the effect of some kind of matrix like polyester, epoxy, and PMMA towards the characteristics of bending and water absorption in hybrid composite with sisal and carbon to strengthen. Then, it is to find out whether or not the hybrid composite endures reduction on bending strength after soaking.

Before making the composite, sisal fiber was treated with alkalization of 6% liquid NaOH for 36 hours. Meanwhile, the carbon fiber was soaked in liquid nitrogen (N₂) for 10 minutes. Each of sisal and carbon was cut into 6 mm and 15 mm. A composite is made with cold press technique, with volume fraction of sisal and carbon fiber as much as 15% each and matrix of 70%. Then, it is molded for 1-8 hours. The test of bending and water absorption that each of them refers to ASTM D790M and ASTM D570 was carried out for all composite specimens. Besides, in this research, bending test was conducted before and after the specimen was soaked in the water for 216 hours (water absorption). The thickness and weight of the specimen of water absorption test were measured once in every 12 hours. The fault results of the bending test was characterized using optical microscope.

The results of the research show that the composite with PMMA matrix has the highest bending strength both before and after soaking i.e. 150.33 MPa, while composite with epoxy matrix and the one with polyester endure decrease on their bending strength before and after soaking, i.e. 0.46% and 0.13%. The value of the bending strength is related to the difference of the result of water absorption test, in which the composite with PMMA matrix shows the lowest increasing value on the thickness and weight, and each of them are 1.99% and 1.64%.

Keywords: Sisal, Carbon, Bending, Epoxy, Polyester, PMMA