

PERFORMANCE OF BURI PALM
(*CORYPHA UTAN*) REINFORCED EPOXY
COMPOSITE: EFFECT OF ALKALI
TREATMENT

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SUPERVISOR'S DECLARATION

We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Master of Science.

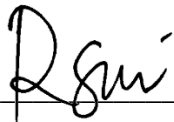


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ABSTRAK

Perkembangan komposit polimer menggunakan polimer bertetulang gentian semula jadi meningkat dalam beberapa tahun kebelakangan ini kerana kesedaran terhadap alam sekitar semakin meningkat. Gentian semula jadi jauh lebih murah berbanding gentian sintetik, dan boleh menggantikannya dalam pelbagai aplikasi, di mana kosnya melebihi keperluan kekuatan. Oleh kerana kosnya yang lebih rendah berbanding dengan gentian sintetik, komposit bertetulang gentian buri (*Corypha utan*) berpotensi besar untuk digunakan dalam aplikasi kejuruteraan. Tujuan kajian ini adalah untuk menganalisis ketumpatan, Fourier transform spectroscopy (FTIR), sifat fizikal dan mekanikal sehelai gentian buri dalam keadaan pengubahsuaian permukaan yang berbeza, iaitu dengan rendaman di dalam 5 wt.% dan 10 wt.% natrium hidroksida (NaOH) selama 1 dan 24 jam. Tujuan penganalisaan kepekatan serasi dalam kajian ini adalah untuk fabrikasi komposit epoksi bertetulang gentian buri dan menilai kesan rawatan gentian terhadap penyerapan air, sifat tegangan dan lenturan. Ketumpatan gentian buri menunjukkan bahawa kepekatan larutan NaOH yang lebih tinggi dan tempoh rendaman yang lebih lama menyebabkan ketumpatan buri lebih rendah. Rawatan terbaik yang dilakukan terhadap sehelai gentian buri adalah yang dirawat dengan rendaman 5 wt.% selama 24 jam menunjukkan kekuatan tegangan tertinggi iaitu sebanyak 159.16 MPa. Ini digunakan untuk membuat komposit empat lapisan dan lima lapisan komposit yang dibuat dengan menggunakan teknik peletakan tangan dan dibantu oleh mesin hidraulic. Eksperimen penyerapan air dilakukan dengan merendam spesimen ke dalam air suling pada suhu bilik sehingga mencapai penyerapan kelembapan tepu. Peratusan pengambilan kelembapan berkurangan untuk gentian empat lapisan dan lima lapisan berbanding lapisan yang dirawat adalah sebanyak 69% dan 95%. Daripada pemerhatian didapati bahawa pembengkakkan ketebalan komposit meningkat dengan peningkatan lapisan pelapisan, sementara pembengkakkan ketebalan menurun dengan gentian yang dirawat. Hasil untuk komposit kering menunjukkan bahawa lima lapisan yang dirawat memberikan kekuatan tegangan dan lenturan tertinggi sebanyak 33.51 MPa dan 56.72 MPa. Akhirnya, pemeriksaan morfologi dilakukan untuk menganalisis tingkah laku patah kegagalan dan kegagalan gentian pada spesimen ujian tarik dengan menggunakan analisis mikroskop. Kesimpulannya, sifat mekanik meningkat seiring dengan peningkatan gentian turutan lapisan gentian yang dirawat dalam komposit. Rawatan alkali mempengaruhi sifat gentian buri yang meningkatkan ikatan antara muka di antara gentian dan matriks epoksi serta memperbaiki sifat tegangan yang lebih baik dan pengurangan penyerapan air.

ABSTRACT

The development of polymer composites using natural fiber reinforced polymer has grown in recent years due to increase in environmental awareness. Natural fibers are much cheaper than synthetic fibers and can be used as a substitute in applications, where the cost concern outweighs strength requirements. Due to the low cost in comparison to synthetic fibers, the buri (*Corypha utan*) fiber reinforced composites have great potential to be used in engineering applications. The aim of this study was to analyse density, Fourier transform spectroscopy (FTIR), and physical and mechanical properties of the single-strand buri palm fiber in different conditions of surface modification, one with 5 wt.% and the other with 10 wt.% sodium hydroxide (NaOH) for 1 and 24 h immersion. This study was to fabricate the buri palm fiber reinforced epoxy composite and evaluate the effects of fiber treatment on water absorption, tensile properties and flexural properties. The density of buri palm fiber showed that a higher NaOH solution concentration and immersion period leads to lower density. The best treatments of single-strand treated with 5 wt.% 24 h immersion showed the highest tensile strength of 159.16 MPa. It was used to fabricate the composite of four-layers and five-layer stacking sequence composite made by using hand lay-up technique and hydraulic press. The water absorption experiment was conducted by immersing the specimen in distilled water at room temperature until it reached the saturated moisture absorption. The percentage of moisture uptake was reduced to 69% and 95% in treated four-layer and five-layer sequences. It is observed that the thickness swelling of the composite increased with the increase of sequence layering, while the thickness swelling decreased with the treated fiber. The results for dry composites show that the five-layer treated gave the highest tensile strength and flexural of 33.51 MPa and 56.72 MPa. Finally, morphology examinations were carried out to analyse the fracture behavior and fiber failure on the tensile test specimen by using Scanning electron microscopy (SEM) and microscope analysis. In conclusion, it would appear that the mechanical properties increased as increase of sequence layering treated fiber composite. Alkali treatment affected the properties of buri palm fiber which improved the interfacial bonding between the fiber and epoxy matrix for better tensile properties and reduced water absorption.

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