INTISARI

Kenaf (Hibiscus cannabius) merupakan salah satu bahan pengisi yang telah dikembangkan oleh industri otomotif, karena keunggulan sifat mekanik yang tinggi, ramah lingkungan dan mudah didapatkan. Penggunaan matriks sebagai bahan pengikat untuk kenaf dan partikel bubuk sebagai penguat telah diteliti namun belum mencapai hasil yang maksimal. Oleh karena itu, penelitian ini mempelajari komposit serat kenaf/*epoxy* dengan penambahan partikel yang berbeda (silika, bentonit, $CaCO_3$) sebagai penguat yang bertujuan untuk mengetahui sifat mekanik dan fisik dari komposit hibrid.

Pada penelitian ini, serat dialkalisasi dengan merendam dalam NaOH larutan 6% selama 36 jam dan dinetralkan dengan asam asetat selama satu jam. Kemudian serat memiliki dengan yang berukuran 5 mm. Komposit hibrid dengan 30% pengisi yang terdiri dari serat kenaf dan berbagai partikulat (silika, bentonit, CaCO3) dibuat dengan metode *hand lay-up* dengan menggunakan mesin hot press pada 100ºC selama 20-50 menit. Uji impak dan bending spesimen komposit masing-masing dilakukan dengan ASTM D6110 dan ASTM D790. Uji daya serap air, berdasarkan ASTM D570, dilakukan selama 216 jam, dan pengukuran berat spesimen dan ketebalan pembengkakan dilakukan setiap 2 jam. Morfologi permukaan patahan impak dilihat dengan *scanning electron microscopy* (SEM) dan mikroskop optik.

Hasil penelitian menunjukkan bahwa nilai kekuatan impak (7.49 kJ/m^2) dan bending (61.09 MPa) diperoleh dari hibrida komposit kenaf/Silika/epoksi mpak terendah (5.36 kJ/m^2) dan *bending* (42,71 MPa) ditunjukkan oleh komposit dengan 2% $CaCO_3$ dan bentonit. Uji daya serap air menunjukkan penambahan berat spesimen terkecil dan penambahan tebal spesimen ditunjukkan oleh komposit kenaf/$CaCO_3$/*epoxy*. Penurunan sifat mekanis disebabkan oleh adanya rongga yang terbentuk di semua komposit seperti yang ditunjukkan oleh SEM. Aglomerasi mikro-partikel dapat menghambat transfer tegangan dari matriks ke serat dan menyebabkan *debonding* dan *fiber pull-out*.

Kata kunci: Serat kenaf, bentonit, $CaCO_3$, silika, uji impak, uji *bendinng*, uji penyerapan air, SEM

ABSTRACK

Kenaf (Hibiscus cannabius) is one of the filler materials that has been developed by the automotive industry, because of its advantages of high mechanical properties, environmentally friendly and easy to obtain. Use of matrix as binders for kenaf and particle powder as the reinforcement has been investigated but has not achieved the maximum results. Therefore, this research studied the composites of kenaf/epoxy fibers with the addition of different particle types (silica, bentonite, $CaCO_3$) as the reinforcement aimed at knowing the mechanical and physical properties of the hybrid composite.

In this study, the fiber alkalized by soaking a 6% NaOH for 36 hours and neutralized with acetic acid for an hour. Then the fibers were chopped into about 5 mm length. The hybrid composites with 30% fillers consisting of kenaf fiber and the various particulates (silica, bentonite, $CaCO_3$) were manufactured by hand lay-up method using hot press machine at 100ºC for 20-50 min. Impact and bending tests of the composite specimens were conducted by following ASTM D6110 and ASTM D790, respectively. Water absorption test, according to ASTM D570 was carried out for 216 h, and the measurement of weight gain and thickness swelling were done each 2 h. The morphology of impact fracture surface was characterized by scanning electron microscopy (SEM) and an optical microscope.

The results indicated that the impact (7.49 kJ/m^2) and bending (61.09 MPa) strength were obtained from the hybrid composite of kenaf/Silica/epoxy with 2% volume fraction of Silica particles. While the lowest impact (5.36 kJ/m^2) and bending (42.71 MPa) strength were shown in the composite with 2% $CaCO_3$ and bentonite. Water absorption test results showed the smallest weight gain and thickness swelling reached by the composite kenaf/$CaCO_3$/epoxy. Decrease of the mechanical properties is caused by the presence of voids formed in all composites as confirmed by SEM. The agglomerated micro-particles can inhibit transfer stress from the matrix to the fiber, increasing the presence of debonding and fiber pull-out.

Keywords: Kenaf fiber, bentonite, $CaCO_3$, silica, impact test, bending test, water absorption Test, SEM