

## INTISARI

Komposit hibrid serbuk kalsium karbonat ( $\text{CaCO}_3$ ) dan serat alam kenaf (*Hisbiscus Canabinus.*) diperkuat *epoxyresin* dikembangkan sebagai kandidat bahan alternatif pada aplikasi *body* gerbong kereta. Keunggulan serat kenaf yaitu mempunyai sifat mekanis tinggi dan dapat diperbaharui sehingga berpotensi sebagai penguat komposit serat alam. Sementara itu, keunggulan *epoxyresin* sebagai matriks adalah mudah dalam penggunaan, tidak berbau tajam dan mampu merekat ke hampir semua permukaan. Perbedaan karakteristik alami serat kenaf yang *hydrophilic* dan *epoxyresin* yang *hydrophobic* mengakibatkan sulit untuk mencapai ikatan homogen serat dalam matriks, hal ini menjadi masalah penting dalam pembuatan bahan komposit serat alam. Perlakuan alkalisasi diharapkan dapat mengatasi defisiensi komposit hibrid kenaf/ $\text{CaCO}_3$ /*epoxyresin*, sehingga matriks dan *fillers* memiliki ikatan yang kuat. Penelitian ini bertujuan untuk mengetahui pengaruh ukuran serbuk  $\text{CaCO}_3$  terhadap sifat mekanis (ketangguhan impak) komposit hibrid kenaf/ $\text{CaCO}_3$ /*epoxyresin*.

Dalam penelitian ini, serat kenaf diberi perlakuan alkalisasi 6% NaOH selama 4 jam. Panjang serat kenaf yang diberi perlakuan alkali  $\pm 6$  mm dan serbuk  $\text{CaCO}_3$  dengan variasi ukuran (sekitar 120 mesh, 200 mesh, 400 mesh) digunakan sebagai *filler*. Komposit hibrid kenaf/ $\text{CaCO}_3$ /*epoxyresin* dibuat dengan mesin *cold press* menggunakan metode *hand lay-up*. Uji ketangguhan impak semua spesimen mengacu pada standar ASTM D6110-04. Permukaan patahan dikarakterisasi menggunakan *scanning electron microscopy* (SEM). Sementara itu, mikroskop optik digunakan untuk mengetahui persebaran serat dalam matriks dari pandangan penampang.

Hasil penelitian menunjukkan komposit hibrid kenaf/ $\text{CaCO}_3$ /*epoxyresin* ukuran serbuk 400 mesh memiliki ketangguhan impak tertinggi 0.00415 J/mm<sup>2</sup>. Semakin kecil ukuran partikel  $\text{CaCO}_3$  maka akan semakin tinggi ketangguhan impak komposit hibrid kenaf/ $\text{CaCO}_3$ /*epoxyresin*.

**Kata kunci :** *Kenaf,  $\text{CaCO}_3$ , epoxyresin, alkalisasi, uji impak, SEM*

## ABSTRACT

The hybrid composites of calcium carbonate powder ( $\text{CaCO}_3$ ) and kenaf natural fiber (*Hibiscus Canabinus*) reinforced epoxy resin have been developed as an alternative material for the locomotive body platform application. The superiority of kenaf fiber such as high mechanical properties and renewable leads to potentially use for the natural fiber composite. Meanwhile, the advantages of epoxy resin as a matrix are easy to use, did not have the strong smell and able to stick to almost any surface. The differences of natural characteristic hydrophilic kenaf fiber and hydrophobic epoxy resin it is challenging to achieve bounding homogenous fibers in the matrix, this is an essential problem in the manufacture of natural fiber composite materials. Alkalization treatment is expected to overcome the kenaf/ $\text{CaCO}_3$ /*epoxyresin* hybrid composite's deficiency, so that matrix and filler have a strong bond. This research aims to find out the effect of calcium carbonate ( $\text{CaCO}_3$ ) powder size towards mechanical properties (impact toughness) of the kenaf/ $\text{CaCO}_3$ /*epoxyresin* hybrid composite.

In this research, kenaf fibers were alkali treated in 6% NaOH for 4 hours. The alkali treated kenaf fiber 6 mm length and  $\text{CaCO}_3$  powder of various sizes (about 120 mesh, 200 mesh and 400 mesh) were used as fillers. The kenaf/ $\text{CaCO}_3$ /*epoxyresin* hybrid composites were fabricated with a cold press machine by hand lay-up method. An impact test was carried out on all composite specimens according to ASTM D6110-04 standard. The fracture surface was characterized using a scanning electron microscope (SEM). Meanwhile, an optical microscope was used to characterize the fiber distribution in the matrix from a cross-section view.

The results showed that kenaf/ $\text{CaCO}_3$ /*epoxyresin* hybrid composite with 400 mesh has the highest impact toughness 0.00415 J/mm<sup>2</sup>. The smaller the size of  $\text{CaCO}_3$  particles the higher the impact toughness of the kenaf/ $\text{CaCO}_3$ /*epoxyresin* hybrid composite.

**Keywords:** *Kenaf, CaCO<sub>3</sub>, epoxy resin, alkalization, impact test, SEM*