INTISARI

Komposit hibrid dari serat abaka dan karbon sebagai penguat *polymethyl methacrylate* (PMMA) berpotensi digunakan untuk aplikasi perangkat biomedis. Sifat-sifat serat dapat mempengaruhi sifat mekanik komposit yang terkait. Dengan demikian, dalam penelitian ini, alkalisasi dilakukan pada serat abaka untuk mengetahui efek perubahan sifat serat abaka dan sifat tarik komposit yang terkait.

Komposit abaka / karbon / PMMA dengan pemuatan serat 20% dibuat menggunakan teknik *hand-lay up* dalam cetakan dingin dengan tekanan 2,185 MPa selama 60 menit. Sebelum fabrikasi, serat abaka diperlakukan alkali dalam larutan NaOH 6% pada suhu kamar untuk berbagai durasi (0, 4, 12, dan 36 jam). Serat karbon direndam dalam cairan N_2 selama sekitar 10 menit. Sifat kimia dan tingkat kristalinitas serat abaka sebelum dan setelah dialkali diperiksa dengan *fourier transformed infrared* (FTIR) *spectroscopy* dan *x-ray diffraction* (XRD). Uji tarik dilakukan pada semua spesimen komposit berdasarkan ASTM D638-01.

Hasil analisis FTIR menunjukkan bahwa *peak* yang terkait dengan hemiselulosa tidak teridentifikasi setelah alkalisasi. Namun, *peak* dikaitkan dengan residu lignin diidentifikasi. Hasil XRD menunjukkan bahwa derajat kristalinitas serat abaka meningkat setelah alkalisasi di mana nilai maksimum (68,12%) tercapai setelah alkalisasi selama 36 jam. Semakin lama alkalisasi serat abaka hingga 36 jam, semakin tinggi sifat tarik komposit yang terkait. Kekuatan tarik tertinggi, regangan, dan modulus elastisitas pada komposit tertinggi pada variasi 36 jam masing-masing 100,31 MPa, 0,00172 dan 5,87 GPa. Dapat disimpulkan bahwa sifat kimia dan kristalinitas serat abaka telah memberikan dampak pada sifat tarik komposit abaka / karbon / PMMA.

Kata kunci: serat abaka, alkalisasi, *fourier transformed infrared*, *x-ray diffraction*, komposit hibrid.

ABSTRACT

The hybrid composite of abaca and carbon fibers reinforced polymethyl methacrylate (PMMA) is potentially used for biomedical device application. The properties of the fibers can influence the mechanical properties of the related composites. Thus, in this research, alkalization was carried out on abaca fibers to study its effects on the changes in abaca fiber properties and tensile properties of the related composites.

The abaca/carbon/PMMA composites with 20% fiber loading were fabricated by hand-lay up technique in a cold press molding at 2.185 MPa for 60 minutes. Before the fabrication, abaca fibers were alkali treated in 6% NaOH solution at room temperature for various durations (0, 4, 12, and 36 h). Carbon fibers were t soaked in the liquid N_2 for about 10 min. The chemical properties and degree of crystallinity of raw and alkali-treated abaca fibers were examined by fourier transformed infrared (FTIR) spectroscopy and x-ray diffraction (XRD), respectively. The tensile test was conducted on all composite specimens based on ASTM D638-01.

FTIR analysis result indicated that the peaks related to hemicellulose were not observed after alkalization. However, peaks attributed to the residual lignin were identified. XRD result showed that the degree of crystallinity of abaca fiber increased after alkalization in which a maximum value (68,12%) reached after alkalization for 36 h. The longer the alkalization of abaca fiber to 36 h, the higher the tensile properties of the related composite. The highest tensile strength, strain, and modulus of elasticity of the composite at the duration of 36 h were 100.31 MPa 0.00172 and 5.87 GPa, respectively. It can be concluded that the chemical properties and crystallinity of the abaca fiber have provided impact on the tensile properties of the abaca/carbon/PMMA hybrid composite.

.

Key words: Abaca fiber, alkalization, fourier transformed infrared, x-ray diffraction hybrid composite.