

PEMBUATAN DAN KARAKTERISASI BANTALAN PENYERAP BERBASIS KITOSAN-HPMC TERINKOPORASI MINYAK CENGKEH SEBAGAI KEMASAN AKTIF

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INTISARI

Pembuatan bantalan penyerap dari polimer alami kitosan dan hidroksipropil metilselulosa (HPMC) terinkorporasi minyak cengkeh sebagai agen antimikroba untuk mengembangkan kemasan aktif telah dilakukan menggunakan metode *freeze drying*. Bantalan penyerap berbasis kitosan-HPMC dilakukan analisa gugus fungsi, kristalinitas, morfologi, ketahanan termal, uji derajat pembengkakan dan uji sifat mekanik. Selanjutnya, bantalan penyerap yang terinkorporasi minyak cengkeh diuji antibakteri dan pelepasan agen antimikrobanya menggunakan kromatografi gas. Penambahan HPMC ke dalam kitosan meningkatkan ketahanan termal, kekuatan mekanik, derajat pembengkakan, kapasitas penyerapan air dan uap air akibat terbentuknya ikat silang antara kedua polimer tersebut. Rasio optimum kitosan:HPMC ialah 1:1,25 (b/b) menghasilkan kekuatan mekanik sebesar $0,75 \pm 0,06 \text{ N/m}^2$ dan derajat pembengkakan sebesar 1393,21%. Inkorporasi minyak cengkeh meningkatkan struktur pori, menurunkan kekuatan mekanik, kemampuan menahan air dan ketahanan termal. Hal ini disebabkan oleh hidrofobisitas dan efek plastikasi dari minyak cengkeh. Pelepasan senyawa antimikroba dievaluasi menggunakan kromatografi gas *headspace*. Bantalan penyerap berbasis kitosan-HPMC terinkorporasi minyak cengkeh dapat melepaskan senyawa eugenol dan menghambat pertumbuhan bakteri *Eschericia coli*, *Listeria monocytogenes*, *Bacillus subtilis*, *Salmonella thypimurium* dan *Staphylococcus aureus*.

Kata kunci: bantalan penyerap, kemasan aktif, kitosan, HPMC, minyak cengkeh

***FABRICATION AND CHARACTERIZATION OF ABSORBENT PAD
CHITOSAN-HPMC BASED INCORPORATED CLOVE OIL AS ACTIVE
PACKAGING***

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ABSTRACT

Absorbent pad based on chitosan and hydroxypropyl methylcellulose (HPMC) incorporated with clove oil as an antibacterial agent for developing active packaging has been developed using a freeze-drying method. Chitosan-HPMC-based absorbent pads were analysed its functional group, cristalinity, morphology, thermal stability, swelling degree and mechanical properties. Furthermore, antibacterial activity and the release of antimicrobial agents of the clove oil-incorporated absorbent pads were also tested. The addition of HPMC to chitosan improved thermal resistance, mechanical strength, swelling degree, water absorption capacity, and water vapor absorption capacity due to the formation of crosslinking between the two polymers. The optimum ratio of chitosan:HPMC was 1:1.25 (w/w), resulting in a mechanical strength of 0.75 ± 0.06 N/m² and a swelling degree of 1393.21%. Incorporating clove oil into chitosan-HPMC enhanced porosity but decreased the mechanical strength, reduced water-holding capacity and its thermal stability due to hydrophobicity and plasticizing effect of clove oil. Absorbent pad based on chitosan-HPMC with clove oil were able to release eugenol, as observed through headspace gas chromatography monitoring. Consequently, it can inhibit the growth of *Eschericia coli*, *Listeria monocytogenes*, *Bacillus subtilis*, *Salmonella thypimurium* and *Staphylococcus aureus*.

Keywords: absorbent pad, active packaging, chitosan, HPMC, clove oil