

**AKTIVITAS ANTIBAKTERI DAN KARAKTERISTIK MEMBRAN
NANOKOMPOSIT KITOSAN/AMMONIUM KLORIDA/ PEG/ MWCNT**

SKRIPSI

Diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains Program
Studi Kimia



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**Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh
gelar Sarjana Sains pada Program Studi Kimia Fakultas Pendidikan
Matematika dan Ilmu Pengetahuan Alam**

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AINNAYA ANNISA

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ABSTRAK

Penelitian ini bertujuan untuk memodifikasi membran nanokomposit kitosan/PEG/MWCNT dengan ammonium klorida (NH_4Cl) sebagai agen antibakteri untuk mengatasi permasalahan biofouling pada membran. Sintesis membran nanokomposit dilakukan melalui metode *solution mixing* dan *casting*, dengan penambahan NH_4Cl secara bervariasi (50-400 ppm), pada kondisi optimum yang diperoleh pada penelitian sebelumnya. Membran hasil sintesis diuji aktifitas antibakterinya menggunakan metode *disc diffusion* dan *total plate counting* terhadap bakteri gram positif *S.aureus* dan gram negative *E.coli*. Karakterisasi membran dilakukan menggunakan analisa spektroskopi FTIR, hidrofilitas, porositas, kekuatan mekanik (*stress*) dan elongasi (*%strain*). Hasil penelitian menunjukkan bahwa penambahan NH_4Cl meningkatkan aktifitas antibakteri (*biofouling*) pada membran kitosan/PEG/MWCNT dengan zona inhibisi 13 mm dan 7.3 mm pada *minimum inhibitory concentration* (MIC) terhadap *S.aureus* dan *E.coli* adalah 50 ppm dan 100 ppm, secara berturut-turut. Peningkatan aktivitas antibakteri membran kitosan/PEG/MWCNT berbanding lurus dengan penambahan NH_4Cl ditunjukkan dengan kenaikan total *bacteria killing ratio* (%BKR) untuk *S.aureus* (3.2% sampai 98.4%) dan *E.coli* (16% sampai 87%). Spektra FTIR menunjukkan interaksi antara NH_4Cl dan membran nanokomposit Kitosan/PEG/MWCNT ditunjukkan dengan kenaikan intensitas setiap penambahan konsentrasi NH_4Cl . Penambahan NH_4Cl memodifikasi hidrofilitas membran (*contact angle* 92° menjadi 83°), sifat mekanik membran (elastisitas 20% menjadi 22% dan *strength* 6.5 MPa menjadi 4.8 MPa), dan porositas membran (48.2% menjadi 52%).

Kata kunci: membran nanokomposit, antibakteri, kitosan/PEG/MWCNT, ammonium klorid-a.

ABSTRACT

*This study aims to modify the chitosan / PEG / MWCNT nanocomposite membrane with ammonium chloride (NH₄Cl) as an antibacterial agent to overcome biofouling problems in membranes. Nanocomposite membrane synthesis was carried out by methods solution mixing and casting, with the addition of NH₄Cl varies (50-400 ppm), at the optimum conditions obtained in previous studies. The synthesized membrane was tested for its antibacterial activity using the method disc diffusion and total plate counting against gram-positive *S.aureus* and gram-negative *E. coli*. Membrane characterization was performed using FTIR spectroscopic analysis, hydrophilicity, porosity, mechanical strength (stress) and elongation (% strain). The results showed that the addition of NH₄Cl increased the antibacterial activity (biofouling) on the chitosan / PEG / MWCNT membrane with 13 mm and 7.3 mm inhibition zones at the minimum inhibitory concentration (MIC) against *S.aureus* and *E.coli*, 50 ppm and 100 ppm. , respectively. The increase in the antibacterial activity of chitosan / PEG / MWCNT membranes was directly proportional to the addition of NH₄Cl, indicated by an increase in the total bacteria killing ratio (% BKR) for *S.aureus* (3.2% to 98.4%) and *E.coli* (16% to 87%). FTIR spectra show the interaction between NH₄Cl and the chitosan/PEG/MWCNT nanocomposite membrane indicated by an increase in the intensity of each addition of NH₄Cl. The addition of NH₄Cl modified membrane hydrophilicity (contact angle 92 (to 83°), membrane mechanical properties (elasticity 20% to 22% and strength 6.5 MPa to 4.8 MPa), and membrane porosity (48.2% to 52%).*

Keywords: *nanocomposites filtration membrane, biofouling, antibacteria, chitosan, PEG, MWCNT, ammonium chloride.*

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