

## ABSTRAK

Fenomena *biofouling* yang diakibatkan oleh mikroorganismenya pada membran filtrasi dapat diatasi dengan menambahkan agen antibakteri pada membran. Penelitian ini bertujuan untuk mengkaji karakteristik dan aktivitas antibakteri iodine yang ditambahkan pada membran filtrasi berbasis komposit kitosan/PEG/MWCNT. Secara khusus metode penelitian meliputi tahap preparasi, uji karakterisasi, dan uji aktivitas antibakteri. Membran komposit kitosan/PEG/MWCNT dipreparasi dengan metode *solution mixing*. Iodin ditambahkan pada membran komposit secara *ex-situ* yaitu dengan merendam membran dalam larutan iodine. Pelarut iodine yang digunakan adalah etanol 95% dan larutan KI (2:1 b/b). Karakterisasi membran komposit dilakukan menggunakan spektroskopi FTIR, difraksi sinar-X, dan pengukuran *tensile strength*. Uji aktivitas antibakteri membran dilakukan terhadap bakteri *Staphylococcus aureus* dan *Escherichia coli*, menggunakan metode cincin inhibisi (Kirby Bauer) dan *Total Plate Counting* (TPC). Hasil penelitian menunjukkan bahwa iodine berinteraksi dengan gugus hidroksil dan amida dari precursor membran seperti ditunjukkan oleh spektra FTIR. Penambahan iodine pada membran komposit menurunkan intensitas difraksi sinar-X membran dan mengurangi % elongasi membran. Dari pengujian metode cincin inhibisi diketahui nilai *Minimum inhibitory concentration* (MIC) membran komposit/Iodin/etanol dan membran komposit/Iodin/KI adalah 0,25% dan 0,05% b/v iodine secara berturut-turut. Aktivitas antibakteri membran semakin besar seiring meningkatnya konsentrasi iodine. *Bacteria Killing Ratio* (%BKR) membran komposit tanpa iodine adalah sebesar 2,08% terhadap *S. aureus* dan 12,18% terhadap *E.coli*. Sedangkan membran komposit/iodine/etanol dan membran komposit/iodine/KI pada MIC memiliki %BKR 57,92 % dan 99,17% terhadap *S. aureus* serta 34,84% dan 100% terhadap *E.coli* secara berturut-turut. Membran komposit kitosan/PEG/MWCNT/Iodin berpotensi untuk diaplikasikan sebagai alternatif membran antibakteri untuk keperluan filtrasi.

Kata kunci : Membran filtrasi, *biofouling*, antibakteri, iodine

## ABSTRACT

*Biofouling phenomena caused by microorganisms activity on filtration membranes can be prevented by adding antibacterial agent onto the membranes. This research aims to evaluate the characteristic and antibacterial activity of Iodine on Chitosan/ PEG/ MWCNT composite based filtration membrane. The research method included preparation, characterization, and antibacterial activity assay. Chitosan/ PEG/ MWCNT composite membrane was prepared by solution mixing method. Iodine was added onto the composite membrane by means of ex-situ coating, through immersing the membrane into iodine solution. Ethanol (95%) and aqueous KI (2:1 w/w) were used as iodine solvents. Characterization of composite membrane was carried out by FTIR spectroscopy, X-ray diffraction, and tensile strength measurement. The antibacterial activity assay was conducted using disc diffusion test (Kirby Bauer) and Total plate counting (TPC) against *Staphylococcus aureus* and *Escherichia coli*. The result showed that iodine interacted with hydroxyl and amide groups of membrane precursors as shown on FTIR spectra. Iodine addition on membrane reduced the intensity of X-ray diffraction as well as % elongation of the membrane. Disc diffusion test showed that the minimum inhibitory concentration (MIC) of iodine/ethanol-composite membrane and iodine/KI - composite membrane were 0,25% and 0,05% w/v, respectively. Antibacterial activity of the composite membranes linearly increased with addition of iodine concentration. Bacteria Killing Ratio (%BKR) of the composite membrane without iodine was 2,08% and 12,18% against *S. aureus* and *E.coli*, respectively. Meanwhile, %BKR of iodine/ethanol - composite membrane and iodine/KI - composite membranes at MIC were 57,92 % and 99,17% against *S. aureus*, and 34,84% and 100% against *E.coli*, respectively. Chitosan/ PEG/ MWCNT/ Iodine composites membrane is potential to be applied as an alternative antibacterial membrane for filtration.*

**Keywords:** *Filtration membrane, biofouling, antibacteria, iodine*