ABSTRAK

Pembuatan membran komposit dilakukan dengan metode inversi fasa. Secara khusus pencampuran polimer matrik dan MWCNT dilakukan dengan teknik *solution mixing*. Karakterisasi struktur, morfologi, dan sifat mekanik membran komposit dilakukan menggunakan spektroskopi FTIR, XRD, SEM, dan pengukuran *Tensile Strength.* Sedangkan kinerja membran komposit ditentukan melalui pengukuran fluks dan rejeksi dengan metoda *dead-end* filtration pada tekanan 2 atm. Hasil penelitian menunjukkan bahwa membran hasil sintesis merupakan membran berpori dengan distribusi ukuran pori heterogen seperti dikonfirmasi gambar SEM. Spektra FTIR menunjukkan adanya interaksi antara kitosan/PEG/MWCNT yang secara dominan berlangsung melalui ikatan hidrogen antar molekul yang ditandai dengan adanya pergeseran dan perubahan intensitas pada puncak serapan untuk *stretching* gugus fungsi O-H/N-H dan *bending* gugus C-O. Difraktogram XRD mengkonfirmasi pengurangan jarak antar polimer matrik dengan penambahan MWCNT. Hasil pengukuran *tensile strength* mengindikasikan peningkatan kekuatan sifat mekanik membran kitosan/PEG/MWCNT. Penambahan MWCNT meningkatkan fluks dan rejeksi membran kitosan/PEG dari 13,4 menjadi 52,5 L/ jam.m^2 dan dari 81,5 menjadi 96,3 %, secara berturut-turut. Efisiensi proses pemurnian air sungai Citarum dengan metode filtrasi ditunjukkan dengan penurunan nilai turbiditas (307 menjadi 12 NTU), *total suspended solid* (TTS) (18 menjadi 1 mg/L), dan *Chemical Oxygen Demand* (COD) (27 menjadi 2 mg/L). Dengan demikian, membran komposit kitosan/PEG/MWCNT berpotensi untuk dikembangkan lebih lanjut sebagai alternatif material membran dalam pemurnian air.

Kata Kunci: kitosan, PEG, MWCNT, membran komposit, filtrasi

ABSTRACT

This study aimed to obtain chitosan/ Polyethylene Glycol (PEG)/Multiwall Carbon Nanotubes (MWCNT) based filtration membrane as well as the information of its characteristics and performances in water purification process of Citarum river uap stream of Daraulin area. In particular, the preparation of composite membranes was conducted via phase inversion method whereas the mixing of polymeric matrices and CNT was conducted via solution mixing method. Characterization of composite membranes was conducted by means of several techniques such as FTIR spectrofotometry, X-ray diffraction, Scanning electron microscopy and tensile strength test. The performance of the composite membran in water purification is determined by measuring the flux and rejection by dead-end filtration at 2 atm. The results showed that the synthesized membrane has a poros structure with heterogeneous pore distributions as confirmed by SEM images. FTIR spectra indicated the interaction between chitosan-PEG-MWCNT which predominantly took place through intermolecular hydrogen bonding as proved by the shifting in peak position and intensity of several functional groups i.e. –OH, -NH and C-O. The X-ray diffraction patterns confirmed the reduction of the distance between the polymer matrices with the addition of MWCNT. The insertion of MWCNT was remarkable increased not only in the mechanical strength of membranes, but also in flux and rejection from 13.4 to 52.5 L / jam.m^2 and from 81.5 into 96.3%, respectively. The efficiency of the purification river water by filtration method indicated by a decrease in turbidity (307 to 12 NTU), total suspended solids (TTS) (18 to 1 mg /L) and Chemical Oxygen Demand (COD) (27 to 2 mg/L). Thus, the composite membrane of chitosan/PEG/MWCNT is potential to be further developed as an alternative membranes in water purification.

Keywords: *Chitosan, PEG, MWCNT, Composite Membrane, Filtration*