

MEMBRAN MATRIKS TERCAMPUR ZEOLIT/Na-ALGINAT/Na-TARTRAT SEBAGAI MEMBRAN SELEKTIVITAS PEMISAH GAS CO₂/CH₄

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INTISARI

Telah dilakukan penelitian mengenai membran matriks tercampur (*Mixed Matrix Membranes* (MMMs)) zeolit/Na-alginat/Na-tartrat sebagai membran selektivitas pemisah gas CO₂/CH₄. Penelitian ini bertujuan untuk mempelajari pengaruh penambahan Na-tartrat terhadap sifat mekanik membran, permeabilitas dan selektivitas MMMs serta mempelajari pengaruh tekanan terhadap permeabilitas dan selektivitas MMMs. Penelitian dilakukan dengan membuat MMMs zeolit/Na-alginat/Na-tartrat dengan variasi rasio massa Na-alginat:Na-tartrat 1:0; 1:0,2; 1:0,5; 1:0,7 dan 1:1,0 (%b/v). Ketiga campuran bahan diaduk selama 36 jam dan dikeringkan selama 96 jam pada suhu ruang. MMMs yang terbentuk diuji menggunakan *Texture Analyzer* dan *Sel Uji Permeasi*, kemudian dikarakterisasi menggunakan instrumen *Fourier Transform Infrared Spectroscopy (FT-IR)* dan *Scanning Electron Microscopy (SEM)*.

Hasil penelitian menunjukkan bahwa penambahan Na-tartrat menaikkan elastisitas dan fleksibilitas membran yang ditunjukkan dengan meningkatnya nilai persen perpanjangan hingga komposisi rasio massa Na-alginat:Na-tartrat 1:0,7 sebesar 29%. Penambahan Na-tartrat menyebabkan laju permeasi gas CO₂ dan CH₄ mengalami kenaikan hingga komposisi rasio massa Na-alginat:Na-tartrat 1:0,7 dengan laju permeasi CO₂ dan CH₄ sebesar $4,170 \times 10^{-6}$ dan $0,363 \times 10^{-6} \text{ cm}^3 \text{ (STP)/cm}^2 \text{ s cmHg}$ dengan selektivitas CO₂/CH₄ sebesar 12,993. Permeabilitas dan selektivitas MMMs terhadap gas CO₂ dan CH₄ terus meningkat seiring dengan kenaikan tekanan. Tekanan maksimum didapat pada tekanan 15 Psi dengan laju permeasi gas CO₂ dan CH₄ sebesar $6,590 \times 10^{-6}$ dan $0,330 \times 10^{-6} \text{ cm}^3 \text{ (STP)/cm}^2 \text{ s cmHg}$ dan selektivitas CO₂/CH₄ sebesar 19,970.

Kata kunci: MMMs, pemisahan gas, Na-tartrat, Na-alginat, zeolit

ZEOLITE/Na-ALGINATE/Na-TARTRATE MIXED MATRIX MEMBRANE AS SELECTIVE MEMBRANE OF CO₂/CH₄ GAS SEPARATION

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ABSTRACT

Research on the mixed matrix membranes (MMMs) zeolite/Na-alginate/Na-tartrate as selective membrane of CO₂/CH₄ gas separation had been done. The purposes of this research were to study the effect of sodium tartrate to the mechanical properties of the membrane, the permeability and the selectivity of MMMs, and the effect of pressure on permeability and selectivity of MMMs as separation membrane CO₂/CH₄. The research was started by making the MMMs zeolite/Na-alginate crosslinked by sodium tartrate with mass ratio of Na-alginate/sodium tartrate 1:0, 1:0.2, 1:0.5, 1:0.7 and 1:1.0 (%b/v). The third mixture had been stirred for 36 hours and dried for 96 hours at room temperature. The MMMs were tested using Texture Analyzer dan Cell Permeation Testing, then the MMMs physical properties was characterized by Fourier Transform Infrared Spectroscopy (FT-IR) and Scanning Electron Microscopy (SEM).

The results showed that the addition of sodium tartrate increased the elasticity and the flexibility of the membrane, it was reflected in the increasing value elongation percentage of MMMs in the composition of the mass ratio of Na-alginate/sodium alginate 1:0.7 by 29%. The effect of sodium tartrate addition against gas permeation rate of CO₂ and CH₄ showed an increase to the composition of the mass ratio of Na-alginate/sodium tartrate 1:0.7 by CO₂ and CH₄ permeation rate of 4.710×10^{-6} and 0.363×10^{-6} cm³(STP)/cm² s cmHg with the selectivity of CO₂/CH₄ at 12.993. The permeation and the selectivity of MMMs showed a linear relation to the increase of pressure. Maximum pressure obtained at the pressure of 15 psi at the permeation rate of CO₂ and CH₄ of 6.590×10^{-6} and 0.330×10^{-6} cm³(STP)/cm² s cmHg and the selectivity of CO₂/CH₄ at 19.970.

Kerwords: MMMs, gas separation, sodium alginate, sodium tartrate, zeolite