

Meliska, Jacqueline M., 2015, Pembuatan dan Karakterisasi Membran Komposit Kitosan-Kalsium Oksida (CaO) Terfosforilasi sebagai *Proton Exchange Membrane Fuel Cell* (PEMFC), skripsi ini dibawah bimbingan Siti Wafiroh, S.Si., M.Si. dan Dr. Abdulloh, M.Si., Departemen Kimia, Fakultas Sains dan Teknologi, Universitas Airlangga, Surabaya.

ABSTRAK

Fuel cell berpotensi sebagai sumber energi alternatif ramah lingkungan dalam mengatasi krisis energi bahan bakar fosil di masa depan. Penelitian ini bertujuan untuk membuat dan mengkarakterisasi membran komposit kitosan-CaO terfosforilasi sebagai *Proton Exchange Membrane Fuel Cell* (PEMFC) dengan variasi penambahan konsentrasi CaO 0, 10, 15, 20, 25, dan 30%. Pembuatan membran dilakukan dengan membuat *dope* larutan kitosan-CaO. Proses pengikat silang membran komposit kitosan-CaO dilakukan melalui perendaman membran dalam larutan glutaraldehid 0,005% dan proses fosforilasi dilakukan melalui perendaman membran dalam larutan STPP 2 N. Karakterisasi membran dilakukan dengan penentuan sifat mekanik melalui uji tarik, uji kapasitas penukar ion, uji *swelling*, analisis gugus fungsi dengan FT-IR, analisis morfologi membran dengan SEM, uji permeabilitas metanol, dan uji konduktivitas proton. Membran komposit kitosan-CaO terfosforilasi yang optimal dengan penambahan CaO sebesar 25% menghasilkan nilai *stress* sebesar 32 kN/cm², modulus young sebesar 1,350 kN/cm², kapasitas penukar ion sebesar 2,413 m_{eq}/g, *swelling* sebesar 26,65%, permeabilitas metanol sebesar 0,161 x 10⁻⁴ kg/m²s, dan konduktivitas proton sebesar 4,75 x 10⁻⁵ S/cm. Berdasarkan hasil analisis tersebut, maka membran komposit kitosan-CaO (25%) terfosforilasi memiliki potensi yang baik untuk aplikasi membran polimer elektrolit dalam PEMFC.

Kata kunci : kitosan, kalsium oksida, terfosforilasi, PEMFC

Meliska, Jacqueline M., 2015, Production and Characterization of Phosphorylated Chitosan-Calcium Oxide Composite Membrane as Proton Exchange Membrane Fuel Cell (PEMFC), final project is under guidance of Siti Wafiroh, S.Si., M.Si. and Dr. Abdulloh, M.Si., Departement of Chemistry, Faculty of Science and Technology, Airlangga University, Surabaya.

ABSTRACT

Fuel cell has potential as an alternative energy sources that environmentally friendly to overcome the energy crisis of fossil fuels in the future. This study aims to create and characterize the composite membrane of chitosan-CaO phosphorylated as Proton Exchange Membrane Fuel Cell (PEMFC) with concentration variation of the CaO addition 0, 10, 15, 20, 25, and 30%. Membrane production is done through making chitosan-CaO dope solution. Crosslinking process of chitosan-CaO composite membrane is submerged in solution of 0.005% glutaraldehyde and phosphorylation process is done through soaking the membrane in solution of 2 N STPP. Characterization of membrane were done by determination of the mechanical properties by tensile test, ion exchange capacity test, swelling test, analysis of functional groups by FT-IR, analysis of membrane morphology by SEM, methanol permeability test, and proton conductivity test. The optimal production of phosphorylation chitosan-CaO composite membrane with the addition of 25% CaO result the value of the stress about 32 kN/cm², Young's modulus about 1,350 kN/cm², ion exchange capacity about 2.413 m_{eq}/g, swelling at 26.65%, methanol permeability about 0.161 x 10⁻⁴ kg/m²s, and proton conductivity about 4.75 x 10⁻⁵ S/cm. Based on the analysis results, the phosphorylation chitosan-CaO (25%) composite membrane has good potentials for the application of the polymer electrolyte membrane in PEMFC.

Keywords : chitosan, calcium oxide, phosphorylated, PEMFC