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FAKULTI SAINS DAN TEKNOLOGI
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FTIR, conductivity and ionic transport study of chitosan doped glycolic acid solid polymer electrolyte as proton conductor for battery application / Mohd Fatihah Mohd Othman.

FTIR, CONDUCTIVITY AND IONIC TRANSPORT STUDY OF CHITOSAN DOPED GLYCOLIC ACID SOLID POLYMER ELECTROLYTE AS PROTON CONDUCTOR FOR BATTERY APPLICATION

By,
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A thesis submitted in partial fulfillment of
the requirements of the award of the degree of
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PENGAKUAN DAN PENGESAHAN LAPORAN PITA I DAN II

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: FTIR I Conductivity and Ionic Transport Study of Chitosan Doped Glycolic Acid Solid polymer Electrolyte As Proton Conductor For Battery Application oleh Mohd Fatihah B. Mohd Othman, no. matrik: UK11845 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Fizik sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sm. Sn. Gunaan fizik Elektronik + Instrumentasi Fakulti Sains dan Teknologi, UMT.

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DECLARATION

I hereby declare that this thesis entitled FTIR, CONDUCTIVITY AND IONIC TRANSPORT STUDY OF CHITOSAN DOPED GLYCOLIC ACID SOLID POLYMER ELECTROLYTE AS PROTON CONDUCTOR FOR BATTERY APPLICATION is the result of my own research except as cited in the references.

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LIST OF ABBREVIATION/SYMBOLS

A	Area of sample holder.
CA	Chitosan acetate.
D	Diffusion of coefficient.
Ea	Activation Energy.
EIS	Electrochemical Impedance Spectroscopy.
FTIR	Fourier Transform Infrared Spectroscopy.
GA	Glycolic acid.
IR	Infrared.
k	Boltzmann constant(1.38E-23).
K	Kelvin.
ℓ	Distance from one complex sites to another.
μ	Mobility of ions.
n	Density of mobile ion.
q	charge of ion.
R^2	Regression Value.
Rb	Bulk resistance.
Scm^{-1}	Siemen per centimeter.
T	Absolute temperature.
τ	Relaxation time.
v	velocity of charge carrying species.
Ze	charge of conducting species.
σ	Conductivity.

ABSTRACT

Films of chitosan- based polymer electrolyte were prepared by technique of solution casting. Fourier Transform Infrared (FTIR) Spectroscopy show that the complexation has occurred. FTIR exhibit shifts in amine bands from 1553 cm^{-1} to a higher wavenumber due to the increment of glycolic acid salt concentration. The effects of addition of glycolic acid on the conductivity, σ and transport properties of chitosan acetate-glycolic acid have been investigated. The highest room temperature conductivity achieved in the chitosan acetate- glycolic acid is 2.97×10^{-8} S cm^{-1}. The transference number measurement was performed to correlate the diffusion phenomena to the conductivity behavior of CA-GA polymer electrolyte. The cation transference numbers, t_+, in the electrolytes were determined by monitoring the current as a function of time on application of a fixed dc voltage (1.5 V) across the sample sandwiched between two stainless steel electrodes. The conductivity, σ was found to be controlled by the mobility, μ and the diffusion coefficient, D. The value of μ_+ and D_+ is higher than μ_- and D_- which implies that the CA-GA polymer is a proton conductor.

ABSTRAK

Filem elektrolit berasakan polimer kitosan telah disediakan menggunakan teknik tebaran larutan. FTIR spektroskopi menunjukkan tindak balas komplek telah berlaku. FTIR teleh menunjukkan berlakunya anjakan pada frekuensi amina dari 1553 cm^{-1} kepada nombor gelombang yang lebih tinggi hasil daripada pertambahan kosentrasi garam asid glikolik. Kesan penambahan garam asid glikolik pada kekonduksian dan perihal gerakan ion CA-GA telah dikaji. 2.97 x 10^{-8} adalah kekonduksian paling tinggi pada suhu bilik. Pengukuran nombor pengubahan telah dilakukan untuk mengaitkan hubungan diantara kekonduksian dan fenomena difusi polimer CA-GA elektrolit. Nombor perubahan kation, t_+ dalam elektrolit telah dikenal pasti dengan menganalisa arus sebagai sebagai fungsi masa dengan aplikasi voltage (1.5 V) tetap merintangi elektrod kalis kotoran. Kekonduktoran, σ telah dikenal pasti dikawal oleh keboleh gerakan ion, μ dan pekali difusi D. nilai μ_+ dan D_+ lebih tinggi berbanding μ_- dan D-. Ini telah membuktikan polimer CA-GA adalah konduktor proton.