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Electrical and ftir study of chitosan based polymer electrolytes
doped glycolic acid / Santana Dee Colone Jani.



PERPUSTAKAAN SULTANAH NUR ZAHIRAH
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JABATAN SAINS FIZIK
FAKULTI SAINS DAN TEKNOLOGI
UNIVERSITI MALAYSIA TERENGGANU

PENGAKUAN DAN PENGESAHAN LAPORAN PITA I DAN II

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: ELECTRICAL AND FTIR STUDY OF CHITOSAN BASED POLYMER ELECTROLYTES DOPED GLYCOLIC ACID

oleh: SANTANA DEE COLONE JAN, no. matrik: UK12142

telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Fizik sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah SMSG (FIZIK ELEKTRONIK DAN INSTRUMENTASIS), Fakulti Sains dan Teknologi, UMT.

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DECLARATION

I hereby declare that this thesis entitled Electrical and FTIR Study of Chitosan Based Polymer Electrolytes Doped Glycolic Acid is the result of my own research except as cited in the references.

Signature : 
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Date : 5 May 2008

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ABSTRACT

The study of chitosan polymer behavior as a solid thin film electrolytes have attracted many researchers to involves into the conductivity exploration of chitosan polymer electrolytes. The prepared chitosan acetate doped glycolic acid (CA-GA) thin film was done in order to find the highest ionic conductivity of chitosan doped glycolic acid at different glycolic acid (GA) concentration and temperature. These thin films doped GA was made by using solution cast technique and analyzed by Fourier Transform Infrared Spectroscopy (FTIR) and Electrochemical Impedence Spectroscopy (EIS). FTIR analysis shows that the carbonyl (C=O) in pure chitosan (CS) spectrum has been shifted to 1637 cm^{-1} in the pure CA. The band at 900 cm^{-1} was due to CH_2 rocking of salt has shifted to the higher wavenumber which contrast to 1074 cm^{-1} peak due to the assignment of C-O stretching of salt has shifted to the lower wavenumber. The C-O stretching mode of GA also can be observed at 1324 cm^{-1} and 1386 cm^{-1} . The C=O stretching mode of GA can be seen at 1641 cm^{-1} . Both 1324 cm^{-1} and 1386 cm^{-1} were attributed to the C-O stretching of GA. These peaks were observed to increase intensity with the increase of salt concentration. Peak at 1641 cm^{-1} observed to be C=O stretching of the GA. In the EIS analysis, the highest ionic conductivity of solid thin film interaction at room temperature was observed to be $2.97 \times 10^{-8}\text{ Scm}^{-1}$ for sample with 20 wt. % concentrated GA. The temperature dependence conductivity shows that it followed the Arrhenius rule. The highest dielectric constant (ϵ') and highest dielectric loss (ϵ'') values were both appeared at highest temperature.

ABSTRAK

Kajian terhadap sifat-sifat polimer elektrolit chitosan sebagai polimer elektrolit pepejal filem nipis telah menarik minat ramai penyelidik melibatkan diri di dalam kajian mengenai kekonduksian chitosan sebagai polimer elektrolit. Tujuan ujikaji terhadap pepejal filem nipis yang diperbuat daripada chitosan asetik dengan asid glikolik adalah bagi mendapatkan kekonduksian tertinggi pepejal filem nipis tersebut terhadap kepekatan asid glikolik dan suhu yang berbeza-beza. Teknik sebaran larutan telah menghasilkan filem-filem nipis daripada campuran chitosan asetik dengan asid glikolik dan seterusnya dianalisis menggunakan Spektroskopi Fourier Inframerah (FTIR) dan Spektroskopi Impidans Elektrolit (EIS). Analisis FTIR menunjukkan anjakan kumpulan karbonil (C=ONHR) di dalam spektrum chitosan asli (CS) teranjak kepada 1637 cm^{-1} di dalam chitosan asetik asli (CA). Manakala, puncak 900 cm^{-1} yang disebabkan oleh penyahmantapan struktur CH_2 garam telah teranjak kepada nombor gelombang yang lebih besar tetapi berlawanan pula dengan anjakan bagi puncak 1074 cm^{-1} yang disebabkan oleh regangan struktur C-O garam teranjak kepada nombor gelombang yang lebih kecil. Mode regangan C-O bagi garam didapati pada 1324 cm^{-1} dan 1386 cm^{-1} . Mode regangan ikatan ganda dua C=O garam pula didapati pada puncak 1641 cm^{-1} . Kedua-dua puncak 1324 cm^{-1} dan 1386 cm^{-1} adalah disebabkan regangan ikatan tunggal C-O garam. Puncak-puncak ini didapati meningkat dari segi keamatannya dengan peningkatan kepekatan garam. Puncak 1641 cm^{-1} dijumpai sebagai regangan ganda dua ikatan C=O bagi garam asid glikolik. Analisis EIS pula menunjukkan kekonduksian ion tertinggi yang dicapai adalah $2.97 \times 10^{-8}\text{ Scm}^{-1}$ iaitu hasil tindak balas filem nipis pepejal pada sampel S4 yang mengandungi 20 wt. % kepekatan GA. Kebergantungan konduktiviti terhadap suhu menunjukkan bahawa ianya mematuhi Hukum Arrhenius. Nilai-nilai dielektrik malar (ϵ_r) dan dielektrik lenyap (ϵ'') tertinggi pula jatuh pada suhu yang paling tinggi.