

THE EFFECT OF DYE PLASTICIZER ON
ANTONIN - BINDING AND SOLID POLYMER
ELECTROLYTE

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**THE EFFECT OF DMF PLASTICIZER ON CHITOSAN – GLYCOLIC ACID
SOLID POLYMER ELECTROLYTE**

By
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the requirements for the award of the degree of
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DECLARATION

I hereby declare that this thesis entitled THE EFFECT OF DMF PLASTICIZER ON CHITOSAN – GLYCOLIC ACID SOLID POLYMER ELECTROLYTE is the result of my own research except as cited in the references.

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THE EFFECT OF DMF PLASTICIZER ON CHITOSAN – GLYCOLIC ACID SOLID POLYMER ELECTROLYTE

ABSTRACT

Plasticized polymer electrolytes composed of chitosan as the host polymer, dimethyl formamide (DMF) as the plasticizer and Glycolic acid (GA) as the doping salt were prepared by the solution cast technique. These complexes with different amounts of plasticizers were investigated as possible ionic conducting polymers. FTIR studies of the chitosan acetate (CA), plasticizer dimethyl formamide (DMF) and their mixtures with Glycolic acid were carried out. CA–GA–DMF spectra for various salt concentrations showed shifting of the band at 767 cm^{-1} to higher wavenumber at 798 cm^{-1} . The band at 767 cm^{-1} represents the $\text{O}=\text{C}\text{---}\text{N}$ group of DMF. The interaction is between the acid cation and the oxygen atom of the $\text{O}=\text{C}\text{---}\text{N}$ since the IR spectrum did not show any shift in the $\text{C}\text{---}\text{N}$ symmetric stretching band due to $\text{OH}\text{---}\text{N}$ interaction. The splitting of the $\text{C}\text{---}\text{N}$ symmetric stretching vibration of the plasticizer into a doublet at 865 and 880 cm^{-1} is evidence of plasticizer–polymer interaction. These shifted peaks were observed to increase intensity with the increase of salt concentration. In the EIS analysis, the highest ionic conductivity of solid thin film interaction at room temperature was observed to be $5.12 \times 10^{-8}\text{ Scm}^{-1}$ for sample with 30 wt. % concentrated DMF. 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 the highest temperature.

KESAN PLASTISIZER DMF KE ATAS ELEKTROLIT POLIMER PEPEJAL CHITOSAN – ASID GLIKOLIK

ABSTRAK

Polimer elektrolit pemplastik yang mengandungi chitosan sebagai polimer utama, dimetil formamida (DMF) sebagai bahan pemplastik dan asid glikolik (GA) sebagai garam telah disediakan dengan menggunakan teknik sebaran larutan. Campuran bahan dengan amaun pemplastik yang berbeza telah disiasat sebagai polimer yang mengalirkan ion. Kajian FTIR terhadap chitosan asetik (CA), plastisizer dimetil formamida (DMF) dan campuran terhadap asid glikolik telah dijalankan. Spektra CA-GA-DMF untuk kepekatan yang pelbagai telah menunjukkan anjakan puncak pada 767 cm^{-1} kepada nombor gelombang yang lebih tinggi iaitu pada 798 cm^{-1} . Puncak pada 767 cm^{-1} menunjukkan kumpulan $\text{O}=\text{C}-\text{N}$ untuk DMF. Interaksi antara kation asid dan atom oksigen untuk $\text{O}=\text{C}-\text{N}$ memandangkan spektra IR tidak menunjukkan sebarang anjakan pada $\text{C}-\text{N}$ bersimetri dengan regangan interaksi $\text{OH}-\text{N}$. Pembahagian $\text{C}-\text{N}$ bersimetri dengan getara regangan yang dialami oleh plastisizer kepada penggandaan 865 dan 880 cm^{-1} merupakan bukti interaksi polimer – plastisizer. Puncak yang teranjak ini telah menunjukkan peningkatan kepekaan dengan peningkatan kepekatan DMF. Dalam analisis EIS, konduktiviti ion yang paling tinggi untuk interaksi filem nipis pada suhu bilik telah diperhatikan pada $5.12 \times 10^{-8}\text{ Scm}^{-1}$ untuk sampel yang berkepekatan 30 wt. % DMF. Kebergantungan konduktiviti terhadap suhu menunjukkan bahawa ianya mematuhi Hukum Arrhenius. Nilai-nilai dielektrik malar (ϵ') dan dielektrik lenyap (ϵ'') tertinggi pula jatuh pada suhu yang paling tinggi.