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Investigation on LiTFSI doped plasticizer as potential solid
electrolytes for lithium batteries / Mohd Hasmin Mhd Hanafiyat

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**INVESTIGATION ON LiTFSI DOPED PLASTICIZERS AS POTENTIAL
SOLID ELECTROLYTES FOR LITHIUM BATTERIES**

By
Mohd Hasmin B. Mhd Hanafiyah

A thesis submitted in partial fulfillment of
the requirements for the award of the degree of
Bachelor Of Applied Science (Physics Electronics and Instrumentations)

**Department of Physical Sciences
Faculty of Science and Technology
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2008**



**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: INVESTIGATION ON LITEST DOPED PLASTICIZERS AS POTENTIAL SOLID ELECTROLYTES FOR LITHIUM BATTERIES

oleh: MOHD HASMIN B. MOHD HANAFIYAH, no. matrik: UK 11889

telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Fizik sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah SARJANA MUDA SAINS GUNAAN FIZIK ELEKTRONIK DAN INSTRUMENTASI Fakulti Sains dan Teknologi, UMT.

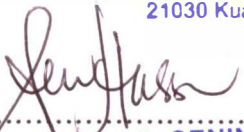
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DECLARATION

I hereby declare that this thesis entitle Investigation on LiTFSI doped Plasticizers as Potential Solid Electrolytes for Lithium Batteries is the result of my own research exept as cited in the references.

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ABSTRACT

Solid polymer electrolytes composed of chitosan and PEO as the host polymer and LiTFSI salt containing EC and PC has been prepared, respectively by the solution cast technique. These complexes with different amounts of plasticizers were investigated as possible ionic conducting polymers by using the Electrochemical Impedance Spectroscopy (EIS). At room temperature, the highest ionic conductivity of the complexes was observed at $1.06 \times 10^{-4} \text{ S cm}^{-1}$ for 45 wt.% of EC and $3.43 \times 10^{-5} \text{ S cm}^{-1}$ for 40 wt.% of PC. The ionic conductivity of the polymer blends increase with increasing the plasticizers concentration could be attributed to the increase in the number mobile ions as a result of plasticizer dissociation. Dielectric data were analyzed using complex permittivity, ϵ^* , complex electrical modulus, M^* and loss tangent, $\tan \delta$. The existences of M_1 peaks indicate that the samples are ionic conductors. Further, the interaction of the polymer chains with the different plasticizers concentration is substantiated by Fourier Transform Infrared (FTIR) spectroscopy. The FTIR spectra have found evidence of a complexation for both EC and PC systems.

ABSTRAK

Elektrolit polimer pepejal menggunakan kitosan dan PEO sebagai hos polimer dan dikisar bersama dengan garam LiTFSI dan mencampurkannya bersama 'plasticizers' seperti EC dan PC, telah disediakan melalui teknik 'solution casting'. Kompleks-kompleks ini disediakan dengan amaun 'plasticizers' yang berbeza-beza telah dianalisis sebagai polimer pengaliran ion dengan menggunakan spektroskopi impedan elektrokimia (EIS). Pada suhu bilik, konduktiviti ionic campuran yang paling tinggi telah dikenalpasti pada $1.06 \times 10^{-4} \text{ S cm}^{-1}$ untuk 45 wt.% EC dan $3.43 \times 10^{-5} \text{ S cm}^{-1}$ untuk 40 wt.% PC. Data dielectric dianalisis dengan menggunakan kompleks ketelusan, ϵ^* dan modulus elektrik, M^* of the sample. Graf kehilangan tangent melawan $\log f$ juga diplotkan apabila garf ketergantungan khayalan, M_1 melawan $\log f$ tidak mempunyai puncak. Seterusnya, interaksi antara rantai-rantai polimer dengan kepekatan 'plasticizers' yang berbeza-beza dianalisis oleh spektroskopi 'Fourier Transform Infrared' (FTIR). Daripada spectrum infra merah, kitosan:PEO dikisar dengan 30 wt.% garam LiTFSI dan kitosan:PEO dengan 30 wt.% garam LiTFSI campur dengan kepekatan 'plasticizers' yang berbeza-beza menunjukkan bahawa kompleks ini adalah bercampur