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Electrical and measurement of properties of methylcellulose
doped adipic acid (MCAA) biopolymer electrolytes / Heng Siaw
Gek.

PERPUSTAKAAN SULTANAH NUR ZAHIRAH
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PERPUSTAKAAN SULTANAH NUR ZAHIRAH UMT

**ELECTRICAL AND MEASUREMENT OF PROPERTIES OF
METHYLCELLULOSE DOPED ADIPIC ACID (MCAA) BIOPOLYMER
ELECTROLYTES**

By
Heng Siaw Gek

A proposal submitted partial fulfillment of
the requirements for the award of the degree of
Bachelor of Applied Science
(Physics, Electronics and Instrumentation)

**DEPARTMENT OF PHYSICAL SCIENCES
FACULTY OF SCIENCE AND TECHNOLOGY
UNIVERSITY MALAYSIA TERENGGANU**

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**JABATAN SAINS FIZIK
FAKULTI SAINS DAN TEKNOLOGI
UNIVERSITI MALAYSIA TERENGGANU**

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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: *Electrical and Measurement of Properties of Methylcellulose Doped Adipic Acid (MCAA) Biopolymer Electrolytes.*

oleh: *Heng Siaw Gek*, no. matrik: *UK 12945*

telah diperiksa dan semua pembedahan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Fizik sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains Gunaan (Fizik Elektronik & Instrumentasi), Fakulti Sains dan Teknologi, UMT.

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DECLARATION

I hereby declare that this thesis entitled “Electrical and Measurement of Properties of Methylcellulose doped Adipic Acid (MCAA) Biopolymer Electrolytes” is the result of my own research except as cited in reference.

Signature : 

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Date : 30 April 2009

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ELECTRICAL AND MEASUREMENT OF PROPERTIES OF METHYLCELLULOSE DOPED ADIPIC ACID (MCAA) BIOPOLYMER ELECTROLYTES

ABSTRACT

Thin films of methylcellulose doped adipic acid (MCAA) made it a good mechanical property. The films were prepared by solution-cast technique. Methylcellulose, a white powder, was added into acetic acid to form methylcellulose acetate and stirred. Until the mixture reached homogenous state, it was added with adipic acid with different concentration and continued to be stirred thoroughly until it become homogenous. Then the mixture was casted into Petri dishes and let dry. Then, transparent and prismatic clear thin films of MCAA were formed. The samples were kept in plastic bags and labelled for further characterizations. Instrument and methods used was Electrochemical Impedance Spectroscopy (EIS). Cole-Cole plots showed that the conductivity, σ is proportional to the salt concentration and also to the temperature. The highest conductivity for the sample at room temperature is $4.66 \times 10^{-9} S m^{-1}$. With temperature applied, the highest conductivity, σ that obtained is $5.59 \times 10^{-9} S m^{-1}$ at temperature of 373 K. The potential energy curve plotted indicated that the MCAA thin films are a good conducting material that there is getting less energy barrier needed for the chemical reaction, at higher temperature for physical transport in forming products. In the study of dielectric and electrical study, all the dielectric constants and modulus showed increment together with the increased of frequencies, as the salt concentration increases. This indicated that the higher values of concentration give rise to inter-particle hindrance and dipolar motion giving rise to higher values of dielectric constant as investigated by Yadav and Gandhi (1992).

KEELEKTRIKAN DAN PENGUKURAN SIFAT-SIFAT ELEKTROLIT BIOPOLIMER CAMPURAN METILSELULOS ASID ADIPIC (MCAA)

ABSTRAK

Filem nipis campuran metilselulos asid adipik (MCAA) menjadikan ia suatu bahan yang bersifat baik dari segi mekanikal. Filem itu disedia dengan teknik sebaran larutan. Metilselulos sejenis serbuk putih, dicampur dalam asid asetik menghasilkan metilselulos acetat dan terus dikacaukan. Apabila campuran itu menjadi homogeny, ia dicampurkan dengan asid adipik yang berlainan konsentrasi dan dikacau sehingga keseluruhan campuran menjadi homogeny. Selepas itu, ia disebar dalam piring Petri dan dikeringkan. Filem nipis MCAA yang lutsinar diperolehi. Instrumen dan alat-alat yang dipakai adalah Spektroskopi Impedans Elektrokimia (EIS). Graf Cole-Cole dilukiskan, menunjukkan bahawa kekonduksian, σ adalah berkadar terus dengan konsentrasi asid dan suhu. Kekonduksian sample yang tertinggi pada suhu bilik ialah $4.66 \times 10^{-9} S m^{-1}$. Apabila dikenakan suhu, kekonduksian yang tertinggi diperolehi ialah $5.59 \times 10^{-9} S m^{-1}$ pada suhu 373 K. Graf tenaga potensi menunjukkan bahawa filem nipis MCAA adalah bahan konduksi yang baik. Bahawa ia mempunyai tenaga rintangan yang kurang diperlukan untuk reaksi kimia pada suhu yang lebih tinggi dan juga untuk pengangkutan fizikal dalam pembentukan produk. Dalam penyelidikan dwielektrik dan elektrik, semua konstan dwielektrik dan modulus menunjukkan kenaikan bersama dengan kenaikan frekwensi apabila kenaikan konsentrasi garam. Ini menunjukkan bahawa konsentrasi yang lebih tinggi meningkatkan patikel perantaraan hindaran dan gerakan dwikutub meningkatkan konstan dwielektrik yang lebih tinggi seperti yang telah diselidikan oleh Yadav dan Gandhi (1992).