UNIVERSITI TEKNOLOGI MARA

PREPARATION AND CHARACTERIZATION OF POLYMER ELECTROLYTES METHYL CELLULOSE BASED POTASSIUM HYDROXIDE FOR ELECTROCHEMICAL CELL

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 19th August 2014 to conduct the final examination of Mas Fiza Binti Mustafa on her Master of Science thesis entitled "Preparation and Characterization of Polymer Electrolytes Methyl Cellulose Based Potassium Hydroxide for Electrochemical Cell" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded relevant degree. The panel of Examiners was as follows:

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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ABSTRACT

In this study, methyl cellulose (MC) was used as the host with potassium hydroxide (KOH) as the ionic doping and dimethyl carbonate (DMC) as plasticizer and aluminum oxide (Al_2O_3) as filler. Films of methyl cellulose (MC), MC-KOH complexes, plasticized MC-KOH complexes and MC-KOH in addition of filler were prepared. The electrical conductivity was calculated using the bulk resistance value obtained from the complex impedance plot in the frequency range from 100 Hz to 1 MHz. This was done for all samples. The film containing 30 weight percent (wt%) of KOH in the methyl cellulose (MC) system exhibits the highest room temperature electrical conductivity of $7.23 \times 10^{-6}\ Scm^{-1}$. The highest electrical conductivity of the plasticized MC-KOH with 15 wt% DMC was $3.61 \times 10^{-5}\ Scm^{-1}$ and $1.46 \times 10^{-5}\ Scm^{-1}$ for film containing 20 wt% alumina filler in the MC-KOH complexes at room temperature. The plot of log conductivity versus 10^3 / T for each film obeys Arrhenius rule inferred that the conductivity was thermally assisted. The regression values are (R^2~1) are from 92% to 98% indicating a good straight line obtained from the plot. The activation energy was calculated from the Arrhenius plots. It was observed that in the increase of conductivity,σ the value of activation energy, E_a decreases and vice versa. The highest conducting value has the lowest E_a of 0.113 eV. The modulus formalism shows that the samples of MC-KOH based electrolytes are ionic conductors. This is supported by results from the infrared (IR) spectroscopy where there were interactions and complexation in the MC-KOH complexes. The highest conducting film was used as a solid polymer in the fabrication of MC-based polymer electrolytes film using zinc as the anode and manganese dioxide as cathode.

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