EFFECT OF TiO_2 NANOFILLER ON PVA/PVP BASED ALKALINE SOLID POLYMER ELECTROLYTE

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NOVEMBER 2008

ACKNOWLEDGEMENT

Alhamdulillah thanks to ALLAH, the almighty God that give me the opportunity to finish this research proposal within the given time.

First of all, thanks to my supervisor, Dr. Muhd Zu Azhan Yahya and co-supervisor, En. Ab Malik Marwan Ali for their continuous advices, comment, guidance and encouragements during, before and after the completion of this final project report.

Special thanks to PM Md. Yusof Theeran as my final year project coordinator for your information, and advice from the beginning, during preparation and the end of my final year project report presentation. And not forgotten to all the master's students for helping me to handle instrument during the experiment is done.

I also want to thanks to my family, who always support me in whatever i do. A deep thankful also to my fellow friends for their supporting and kind assistance that make my work easier. Also thanks to the UiTM management who provide a good facilities that lead to my successful project and produced excellent graduates.

Lastly thanks to anyone that involve in this project, directly or indirectly. Thank you very much.

Noor Izzati Binti Zarawi

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ABSTRACT

EFFECT OF TiO_2 NANOFILLER ON PVA/PVP BASED ALKALINE SOLID POLYMER ELECTROLYTE

Alkaline solid polymer electrolyte (ASPBE) containing a blend of poly(vinylalcohol) (PVA) and poly(vinylpyrrolidone) (PVP), potassium hydroxide (KOH) as an ionic dopant as well as titanium(IV)dioxide (TiO_2) as a nanofiller were prepared by solution casting technique. The concentration ratios of the polymer blend, ionic dopant and nanofiller were varied systematically. The conductivity was studied using impedance spectroscopy in order to investigate ionic conduction in composite PVA/PVP-KOH + TiO_2 electrolyte systems. The conductivity for composite samples with selected composition from 4 wt.%, 6 wt.%, 8 wt.% and 9 wt.% of TiO_2 were determined at various temperatures. The 8 wt.% composition of TiO_2 nanofiller sample gave the highest conductivity of 1.43×10^{-1} S/cm at room temperature. The conductivity–temperature dependence of the entire samples obeyed Arrehenius rule implying that a hoping mechanism of the in charge carrier is taken place. The activation energy, E_a of 0.3144 eV was obtained for the highest conducting sample. Electrical properties were than further characterized on the data collected from impedance studies. The conduction mechanism of the charge carrier followed quantum mechanical tunneling (QMT) model. This conduction mechanism apparently occurred according to ion hopping mechanisms.