

C
530
KAR

**TRANSPORT PROPERTIES OF POLYMER ELECTROLYTES
BASED ON POLY(ETHYLENE OXIDE) COMPLEXED WITH
MAGNESIUM SALTS**

A PROJECT REPORT PRESENTED BY

L.H.KARALLIYADDE

to the Board of Study in Physics of the
POST GRADUATE INSTITUTE OF SCIENCE

*in partial fulfillment of the requirement
for the award of degree of*

MASTER OF SCIENCE IN PHYSICS OF MATERIALS

of the

UNIVERSITY OF PERADENIYA

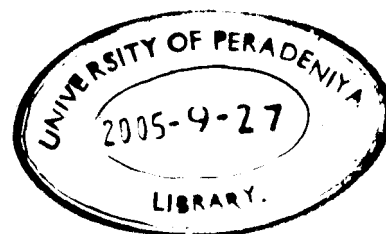
SRI LANKA

2004

580444

TRANSPORT PROPERTIES OF POLYMER ELECTROLYTES BASED ON POLY(ETHYLENE OXIDE) COMPLEXED WITH MAGNESIUM SALTS

L.H.Karalliyadde
Department of Physics
University of Peradeniya
Peradeniya
Sri Lanka



Thermal, conductivity, electrical conductivity and FTIR measurements have been performed on $(\text{PEO})_9\text{Mg}(\text{ClO}_4)_2$ and $(\text{PEO})_9\text{Mg}(\text{ClO}_4)_2 + 10 \text{ wt.}\% \text{ Al}_2\text{O}_3$ (acidic) nano-porous polymer electrolyte systems. It is observed that the conductivity enhances substantially due to the presence of the 10 wt.% Al_2O_3 filler particles. The results reveal that the filler particles do not interact directly with poly(ethylene oxide) (PEO) chains, indicating that the main chain dynamics governing the ionic transport has not significantly been affected due to the filler. The results are consistent with the idea that the conductivity enhancement is probably due to the creation of additional sites and favourable conduction pathways for ionic transport through Lewis acid-base type interactions between the filler surface groups and the ionic species. An additional contribution to conductivity enhancement may also come from the increased amorphosity of the electrolyte due to the 10 wt.% Al_2O_3 filler. This is reflected as an increase in the mobility rather than an increase in the number of charge carriers.

The cell, $\text{Mg} / (\text{PEO})_9\text{Mg}(\text{ClO}_4)_2 + 10 \text{ wt.}\% \text{ Al}_2\text{O}_3 / \text{MnO}_2 / \text{Al}$ gives a high steady voltage and may be optimized for better performance. It appears that, intercalation materials are more suitable to be used as the cathode material in the fabrication of this type of cells.