

U30
JAY

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

A PROJECT REPORT PRESENTED BY

P. A. M. T. JAYATHILAKA
~

to the Board of Study in Physics of the
POSTGRADUATE 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

2005

603410

ABSTRACT

P. A. M. T. Jayathilaka

Department of Physics

University of Peradeniya

Peradeniya

Sri Lanaka

Polymer electrolyte membranes have receiving a considerable attention in the recent past due to the possibility of using them as electrolytes in rechargeable batteries and other electrochemical devices. Among these electrolytes copper salt based electrolytes ~~have several advantages~~ over Lithium salt based electrolytes. Low cost, environmental and chemical stability, possibility of using Copper metal as an anode are some of these advantages. In this work we have synthesized $\text{PEO}_n\text{Cu}(\text{ClO}_4)_2$ and $\text{PEO}_n\text{CuCl}_2$ electrolytes with $n=3$ to $n=15$ and $\text{PEO}_6\text{CuCl}_2+10\text{wt}\%\text{Al}_2\text{O}_3$ and characterized them using electrical and thermal measurements. Results show that, out of the eight compositions studied, the $\text{PEO}_6\text{Cu}(\text{ClO}_4)_2$ composition had the maximum conductivity from room temperature up to 80°C .

$\text{PEO}_6\text{CuCl}_2+10\text{wt}\%\text{Al}_2\text{O}_3(\text{acidic})$ polymer electrolyte shows that the conductivity is enhanced due to the presence of the 10wt% Al_2O_3 filler particles. DC polarization measurements reveal that the majority of current carries by a single ion type. The results suggests that Lewis acid-base type intractions by H/OH groups on the surface of Al_2O_3 cations and anions and creating additional sites and favourable conducting pathways in the vicinity of grains for the migration of ions are responsible for the observed conductivity enhancement. According to the DC polarization measurements, the majority of current carries appears to be anions.