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

A PROJECT REPORT PRESENTED BY

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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

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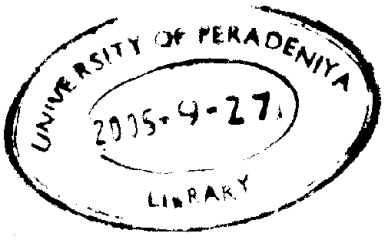

Transport properties of PAN: $Cu(ClO_4)_2$ polymer electrolyte and $(PEO)_9CuCNS$ polymer electrolyte have been studied..

Three PAN based electrolytes were made with different composition of polyacrylonitrile (PAN), ethylene carbonate (EC), propylene carbonate (PC) and copper perchlorate $Cu(ClO_4)_2$. The highest conductivity was obtained for the 20 wt% PAN: 41 wt% EC : 34 wt% PC : 5 wt% $Cu(ClO_4)_2$ system over the entire temperature range. DC impedance measurements show that this PAN based polymer electrolytes are predominantly ionic conductors and the AC impedance shows that the electrolytes reach conductivities of the order of 10^{-2} Scm^{-1} around 80 ^0C. Even at room temperature, the conductivity remains quite high, of the order of 10^{-3} Scm^{-1}. The temperature variations of all PAN based systems follow VTF behaviour and DC polarization measurements show that the dominant charge carriers appear to be ClO_4^-

DC .measurements show that the composite polymer electrolyte $(PEO)_9CuCNS+10wt\%Al_2O_3$ and polymer free electrolyte are mixed ion conductors, predominantly with anionic conductivity. Ionic conductivity of the composite electrolyte, $(PEO)_9CuCNS+10wt\%Al_2O_3$ has enhanced substantially due to the presence of Al_2O_3 filler at temperatures above as well as below the PEO crystallite melting temperature (~ 60°C). This enhancement can be attributed to the creation of additional sites and favourable conducting pathways due to H-bonding between ClO_4^- and OH groups at Al_2O_3 grain surface. Another important conclusion that can be arrived from these observations is that the anionic transference number is significantly increased due to the addition of Al_2O_3.