Chapter 5

Conclusions and suggestions for further work

5.0 CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

5.1 Conclusions

PVC and salt complexes were synthesized. Various spectroscopic and electrical experimental techniques have been used to characterize the prepared solid polymer electrolytes. PVC was used as the polymer matrix and $LiClO_4$, $LiBF_4$, LiI, $LiCF_3SO_3$ and $CoCl_2$ salts were added as dopants. Among the samples studied, the PVC - $LiClO_4$ sample, with a concentration of 70wt% : 30wt% showed a good conductivity value of 1.63×10^{-7} S/cm.

In order to improve upon this conductivity value, a combination of plasticizers such as ethylene carbonate (EC) and propylene carbonate (PC) were added to the above polymer – salt complex. A value of 3.34×10^{-4} S/cm was obtained with a concentration of 11.7 wt% of PVC : 5 wt% of $LiClO_4$: 13.3 wt% of EC and 70 wt% of PC.

This work was carried out as a small part of an extensive study to look at the behaviour of these doped PVC based electrolytes. Further works are suggested below:

5.2 Suggestions

Continuous work is being carried out to focus on further improving solid polymer electrolyte conductivity at ambient temperature. Solid state battery is conceived as the main area of application for these polymer electrolytes. The conductivity of doped PVC is still considered the major limitation for room temperature solid state batteries. The discharge performance of such batteries

decline over a period of cycling and this is perceived as another tumbling block in using polymer electrolytes as batteries, even though Li^+ doped polymer batteries have been reported to be commercialized [83]. Developments are undergoing to utilize these polymer electrolytes for less demanding electrochemical applications such as electrochromic devices and sensor. Also with innovative manufacturing processes and thin film manipulation and control, application of solid polymer electrolytes to batteries and other new areas of application looks promising. Further works need to be carried out to improve the mechanical and electrical properties of doped PVC for application purposes. Some of the works are suggested below:

- Transport number experiment to be carried out to correlate the cation concentration in polymer matrix to cations transference number.
- Mechanical strength experiments to be carried out to determine its stress strain properties for packaging purposes.
- Fabricate battery and characterize their discharge performance for various electrode and intercalation materials.
- Carry out electrical recycling (voltammogram) experiments to study doped PVC's electrochemical stability.