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**CHARACTERIZATION OF POLY (VINYL CHLORIDE)
BASED ELECTROLYTES AND BATTERIES**

BY

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A dissertation submitted in partial fulfilment of the requirement for the
Degree of Master of Technology (Material Science)

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MALAYSIA

1999

Perpustakaan Universiti Malaya



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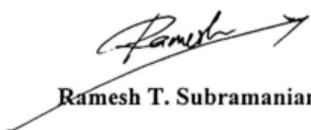
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DECLARATION

I hereby declare that the work reported in this dissertation is my own
unless specified and duly acknowledged by quotation.

25 March 1999


Ramesh T. Subramaniam

ACKNOWLEDGEMENTS

First and foremost, my most sincere and profound appreciation to my supervisor, Associate Professor Dr. Abdul Kariem Arof for his instrumental role in assisting me to complete this dissertation. His valuable guidance was an essential factor in the progress of my work. A note of gratitude I wish to also extend to Dr. D.K. Roy, the co-supervisor, who provided motivation when I most required it.

A special word of thanks to Professor Dr. S. Radhakrishna for his words of encouragement, without which, I may not have ventured in this field. To my laboratory mates, Jacob, Mathi, Venga, Lim, Rajan, Anand, Shamim, Baharam, Sundar, Amin, Vicky, Bouzid, Zu, Malik and Zurina I wish to extend my gratitude for all their help and I will cherish the moments we spent together working on our individual as well as common goals.

I would also like to take this opportunity to thank my fellow friends and housemates, namely Raman, Terence, Nantha, Stephen, Kapar, Selva, Gandhi, Prakash, Murali, Raghu, Rotu, Sivam, Mano, Rajesh, Karu, Mani, Jesu, Dass, SP, Sashi, Shankar and others who had directly or indirectly contributed towards my efforts in completing this work.

A note of gratitude also goes to the staff of SIRIM laboratory, Chemistry Dept. laboratory (UM) and Physics Dept. laboratory (UM) for the assistance provided during the course of my work. My gratitude also goes out to IRPA for the valuable financial aid provided which greatly contributed towards the successful completion of my dissertation.

Last but certainly not least, I owe a great deal to my mother, brother, sister-in-law, sisters and my nephews who have, in more ways than one, encouraged and assisted me in my endeavours.

My final acknowledgement goes out to the One who has no finality. He has answered my prayers in many ways and blessed me with the faculties that has enabled me to achieve this success.

ABSTRACT

Poly (vinyl chloride) has an electrical conductivity of 10^{-8} S/cm⁻¹. It can serve as a host matrix for solvating lithium salts. The highest room temperature electrical conductivity of 5.2×10^{-6} S/cm was achieved for the composition of 50 wt % PVC, 15 wt % LiCF₃SO₃ and 35 wt % LiBF₄. The conductivity value was still in the order of 10^{-6} S/cm upon adding ethylene carbonate (EC). With the aim to raise the room temperature ionic conductivity of PVC based polymer electrolyte and considering that the ionic conduction preferentially occurs in the amorphous phase, the PVC powder was irradiated and the crystallinity was further suppressed by plasticizing with ethylene carbonate (EC). By incorporating LiBF₄ and LiCF₃SO₃ to the above described polymer host, the ambient ionic conductivity of the electrolyte could reach as high as 4.5×10^{-4} S/cm. The conductivity was further enhanced by adding both ethylene carbonate (EC) and propylene carbonate (PC) as plasticizers. At room temperature the conductivity value of 2.60×10^{-3} S/cm was obtained with a concentration of 9 wt % PVC, 2.7wt% LiCF₃SO₃, 6.3 wt % LiBF₄, 12 wt % EC and 70 wt % PC. The conductivity-temperature data of plasticized PVC electrolytes follows the Arrhenius relationship. In addition, the polymer electrolyte samples were investigated using transference number, X-ray diffraction, DSC and TGA techniques. The sample which shows highest ionic conductivity at room temperature was used to assemble a solid state battery and its characteristics were presented and discussed.

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