PREFACE

In the field of *Solid State Ionics*, solid electrolytes successfully compensate the lag of performance of liquid electrolytes and become suitable candidates for technological applications in various electrochemical devices. In this way, solid electrolytes prove to be successful replacements over liquid electrolytes. These solid electrolytes conduct via ionic motion likewise liquid electrolytes and can be subdivided into glass, ceramic and polymer electrolytes. Amongst these solid electrolytes, a considerable attention is given to the polymer electrolytes since long owing to their several significant advantageous properties. But low ionic conductivity, especially at room temperature, is one of their limiting factors. To overcome this limitation and to improve their ionic conductivity and other electrolytic properties, several efforts are extensively made which include polymer blending, plasticization and incorporation of nano-filler.

In the view of this discussion, the present thesis deals with the preparation, characterization and investigation of transport, electrical, relaxation and dielectric properties of the as prepared plasticized and plasticized nano-composite PVA-PEO blend electrolyte systems and their applicability in the lab-prepared Ag^{+} and Li^{+} conducting solid state primary polymer batteries using the respectively suitable anodes and lab-made cathodes. The thesis majorly focuses on the study of electrochemical properties of the as prepared PVA-PEO blend polymer electrolytes and lab-made cathode materials.

The present thesis is bifurcated into seven chapters wherein, ***Chapter-1*** in general introduces the field of Solid State Ionics and throws light on solid electrolytes and their types. The main focus is done on different types of polymer electrolytes and their applications in various solid state electrochemical devices. ***Chapter-2*** deals with ion conduction mechanism and ion dynamics taking place in solid electrolytes, especially in polymer electrolytes and provides an insight regarding various theories and theoretical models of conductivity and

different formalisms of impedance spectroscopy. Later, the methods of preparation of blend polymer electrolyte specimens and suitable cathode materials and various experimental techniques characterizing these materials are discussed in ***Chapter-3***. Characterization studies of the as prepared blend specimens and cathode materials carried out using these experimental techniques are discussed in ***Chapter-4***. ***Chapter-5*** explains the results of impedance spectroscopy formalisms which include ac/dc conductivity, relaxation and dielectric properties of the as prepared blend specimens with respect to temperature as well as concentrations of various constituents incorporated therein. ***Chapter-6*** covers the investigations of electrochemical studies of the as prepared cathodes and optimized blend polymer electrolytes assembled in the respective lab-made Ag^+ and Li^+ primary polymer batteries and the study of discharge characteristics of these batteries and related battery parameters. Finally, ***Chapter-7*** ensembles the conclusions emerging from the (i) characterization results and transport, electrical, relaxation and dielectric studies of the as prepared blend polymer electrolyte specimens and (ii) discharge characteristics and electrochemical parameters of Ag^+ and Li^+ primary polymer batteries.

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