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Lithium and non-lithium solid polymer electrolytes: potential energy materials for all-solid state battery applications

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B atteries are the integral part of our day-today activity and are considered as one of the highest consumable commodity of human society. Presently, batteries fulfill many of the major energy demands in various sectors including low power electric and electronic appliances to heavy EVs. Most of the modern portable batteries are based on lithium chemical polymer electrolytes. They captured >70% commercial market today. However, lithium batteries have recently witnessed some serious fire incidences primarily due to use of lithium chemicals. On account of high safety concerns of the batteries while in use, it is being felt very strongly to replace the lithium chemical based battery components (viz. electrodes and polymer electrolytes) by non-lithium chemical based components. In the recent years, dry polymer electrolytes in thin flexible film form attracted tremendous technological attention as promising candidates to develop all-solid-state battery. The present talk will give an overview on the progress made in designing polymer electrolyte materials. Both lithium and non-lithium polymer electrolytes, reported in the literature, will be reviewed briefly. The strategy adopted to enhance room temperature conductivity of these systems will be discussed in brief along with the film casting procedures and the techniques commonly employed to characterize the materials and ion transport properties. Some major shortcomings of lithium polymer electrolytes will be highlighted. The results of some non-lithium dry polymer electrolytes discovered in present laboratory in the recent past will be discussed in brief.

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