Poly (perfluorinated ethylenmethylen oxide) [PPFEMO] as a new type of plasticizer for PEO based solid polymer elctrolytes

Solid polymer electrolytes, plasticized with conventional plasicisers such as ethylene carbonate and propylene carbonate, have received much attention in the past as possible electrolyte materials for solid state batteries and other devices, due to their ease of fabrication and low cost.

A novel and interesting way for plasticizing polymers is to use a fine colloidal dispersion between an inert polymeric material and a " conventional" polymer electrolyte such as poly (ethylene oxide) PEO). The objective of this work is to study the

effect of addition of Poly (perfluorinated ethylenmethylen oxide) (PPFEMO) to PEO-Li salt systems.

The weight percentage of plasticizer added to the polymer was varied from 10 to 100% and the concentration of salt in the polymer was fixed at n = 9. the solvent casting technique, using acetonitrile as the solvent was used to prepare the two soild electrolytes, $(PEO)_nLiX$, where X = $LiCF_3SO_3$ or $LiN(CF_3SO_3)_2$, incorporating the finely dispersed plasticizer. PPEMO. The electrical conductivity was enhanced due to the addition of the plasticizer.

The highest conductivity of 2.52×10^{-5} S. cm^{-1} at room temperature (22 ^oC) was obtained for the system $(PEO)_9$ $LiN(CF_3SO_2)_2$ + 100% [PPFEMO] and the conductivity of the system $(PEO)_9$ Li CF_3SO_3 + 100% [PPFEMO] was 9.56×10^{-7} S cm-1 at the same temperature. The dielectric results show very high values of the permittivity for the plasticized samples, indicating that phase separation takes place in these materials.

The chain mobility appears to be enhanced both by a reduction of crystallinity and lowering of the glass transition temperature. However, in contrast to polymer salt complexes made with more "conventional" plasticizers, such as ethylene carbonate(EC) and propylene carbobate (PC), these polymer salt complexes are completely insoluble in PPFEMO. This new approach to plasticizing effect in solid polymer electrolytes can offer interesting solutions to the enhancement of room temperature conductivity in the field of rechargeable lithium batteries.