E1-12 Effect of plasticizers on the ionic conductivity of PEO-$LiCF_3SO_3$ electrolytes

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The ionic conductivity of polyethylene oxide (PEO) based salt-polymer electrolytes is still low for many practical applications. The addition of a high permittivity plasticizer will promote the dissociation of salt by reducing the degree of crystallinity and the glass transition temperature. Therefore, the effect of addition of ethylene carbonate (EC) and propylene carbonate (PC) was studied.

The $(PEO)_9LiCF_3SO_3$ complex was prepared and the plasticizer EC or PC was added upto 50 mol% of PEO by the solvent casting method. The membranes obtained were 0.1 - 0.5 mm thick. The conductivity was measured in an argon

atmosphere by complex impedance technique. The glass transition temperature and degree of crystallinity were determined by DSC. The ionic conductivity of the PEO-$LiCF_3SO_3$ complex increased with addition of plasticizers. For example, with no plasticizer the $(PEO)_9LiCF_3SO_3$ complex had a conductivity of 2.5×10^{-5} S cm^{-1} at 332 K. When 50 mol% of EC is added the conductivity increased to 9.0×10^{-4} S cm^{-1} and with 50 mol% of PC the conductivity increased to 5.2×10^{-5} S cm^{-1}.

The addition of plasticizer up to 50% does not reduce mechanical properties considerably but it reduces the glass transition temperature, crystallinity and enhances dielectric properties to some extent. Furthermore the cost of the electrolyte is reduced since the $LiCF_3SO_3$ concentration is low in plasticizer-added PEO complex.

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