

## **Enhanced ionic conductivity in PEO/PMMA glassy miscible blends: Role of nano-confinement of minority component chains**

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AC Impedance Spectroscopy was used to investigate the ionic conductivity of solution cast poly(ethylene oxide) (PEO) / poly(methyl methacrylate) (PMMA) blends doped with Lithium perchlorate. According to FTIR Spectroscopy, there is no trace of water and solvent left in samples. Based on DSC and DMTA graphs, all systems are fully miscible and glassy at room temperature. Conductivity measurements indicate that at low PEO contents (below overlap weight fraction  $w^*$ ), ionic conductivities are almost low. This could be due to nearly distant PEO chains in blend, which means ion transportation cannot be performed adequately. However, at weight fractions well above  $w^*$ , a significant increase in ionic conductivity was observed. This enhanced ionic conductivity mimics the PEO segmental relaxation in rigid PMMA matrix, which can be attributed to the accelerated motions of confined PEO chains in PMMA matrix. At PEO content higher than 20 wt%, the conductivity measured at room temperature drops due to crystallization of PEO. However by increasing temperature to temperatures well above the melting point of PEO, a sudden increase of conductivity was observed which was attributed to phase transition from crystalline to amorphous state. The results indicate that some PEO/PMMA blends with well enough PEO content, which are structurally solid, can be considered as an interesting candidate for usage as solid-state electrolytes in Lithium batteries.