Polymer/Metal Complexes ; Use of Quadruple Hydrogen-Bonded Supramolecule

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A supramolecular material containing quadruple hydrogen bonding sites was prepared by reacting the amines of methyl isocytosine (MIC) and the epoxy groups of poly(ethylene glycol diglycidyl ether) (PEG DGE). This supramolecular polymer was complexed with metal salt, i.e. KI, to produce polymer electrolytes and their physical properties, specific interactions and conductivity behavior were investigated. The ionic conductivity of polymer electrolytes continuously increased with increasing salt concentration up to 0.4 of salt weight fraction, presenting usually high solubility limit of salt in the supramolecular polymer. Wide angle x-ray scattering data also presented that the metal salt was completely dissolved in the supramolecular polymer. Upon the introduction of metal salt, the mechanical properties of the supramolecular polymer were significantly enhanced by around 10 times and the Tg of the polymer increased, as revealed by complex melt viscosities and DSC. These unusual behaviors of salt solubility and mechanical properties for supramolecular polymer/metal salt complexes were attributed to the strong, additional metal ion coordination to hydrogen bonding sites as well as ether oxygens of polymer matrix.