

Studies on LiCF₃SO₃-doped magnetite-ENR polymer electrolytes

W. L. Tan and M. Abu Bakar*

Nanoscience Research Laboratory
School of Chemical Sciences, Universiti Sains Malaysia
11800 Penang, Malaysia

* Corresponding Author

E-mail: bmohamad@usm.my; Fax: 04-6574854

Abstract

Magnetite-ENR polymer electrolytes doped with various % wt of LiCF₃SO₃ salt were synthesized *in-situ* in the presence of ENR and cast into film doped with LiCF₃SO₃. XRD results confirmed the purity of the as-formed magnetite particles. The diffraction peaks assigned for LiCF₃SO₃ become more intense as the concentration of salt is increased. FTIR analyses showed that both “free” (dissociation) and ion pairs (association) of LiCF₃SO₃ were present in the electrolytes system. Nevertheless, the degree of LiCF₃SO₃ dissociation was enhanced by the presence of magnetite particles. Magnetite particles as small as ~4 nm were successfully synthesized and dispersed in the ENR as revealed by TEM micrographs. The homogeneity and distribution of magnetite particles and LiCF₃SO₃ salt in the polymer electrolytes system was confirmed by the SEM and x-mapping techniques. Thermal behavior of the polymer electrolytes was evaluated using DSC and TGA. Glass transition temperature (T_g) increased with increasing of %wt LiCF₃SO₃. This implies the plausible formation of Li⁺-ENR complexation. LiCF₃SO₃-doped magnetite-ENR polymer electrolytes were thermally less stable as compared to that of neat ENR. Even so, they still offer good thermal stability to meet the requirement for battery applications where the initial degradation temperature (T_i) is >300 °C.

Keywords: magnetite, polymer electrolytes, LiCF₃SO₃, ENR