

UV-Cured Blend Polymer Electrolytes For Lithium Polymer Battery

Yong-Tae Kim, Min-Kyu Song, Byung-Won Cho*,
Hee-Woo Rhee
Department of Chemical Engineering,
Sogang University, Seoul 121-742, Korea
*Battery & Fuel Cell Research Center,
Korea Institute Science and Technology,
Seoul 136-791, Korea

Lithium Polymer Battery(LPB) possesses its distinct advantages such as safety, environmental compatibility and scalability. But, there are still many critical challenges to be met. Among them polymer electrolytes is the core of the research and development. Polymer electrolytes based on PVdF[1], PAN[2], PMMA[3], etc. have high viscosity in melt state, which is an obstacle for processing. On the contrary, UV-curable electrolytes, represented by ethyleneglycol diacrylate (EGDA)[4] or ethyleneglycol dimethacrylate (EGDMA)[5], can be directly cross-linked on cathode or anode laminates under UV irradiation, which will result in high productivity. But conventional UV-cured polymer electrolytes have poor mechanical and electrochemical properties because of their glassy nature.

To improve electrochemical and mechanical properties of UV-cured polymer electrolytes, we prepared a polymer electrolyte by blending PEGDA, PVdF and PMMA. PVdF was added to improve mechanical properties and PMMA was to impede the outflow of organic solvent by increasing an affinity for it. Liquid EGDA oligomer was mixed with PVdF and PMMA in the presence of organic solvent composed of ethylene carbonate, dimethyl carbonate, ethylmethyl carbonate containing LiPF_6 at the mild temperature. And the mixed slurry was coated onto Mylar® film using doctor blade and then cured under UV irradiation.

To study electrochemical properties of the blend polymer electrolyte, we investigated ionic conductivity, cation transference number, electrochemical stability window and battery performance as a function of blend ratio, content of some organic solvent, and amount of initiator. Also we studied the mechanical properties of the blend polymer electrolyte.

References

1. E. Tsushida, H. Ohno and K. Tusnmi, *Electrochimica Acta*, **28**, 591 (1983).
2. M. Watanabe and A. Nishimoto, *ibid*, **79**, 306 (1995).
3. W. Wixwat, J.R. Stevens, A.M. Anderson, and C.G. Granqvist, *Second International Symposium on Polymer Electrolytes*, B. Scrosati, Editor **461**, Elsevier Appl. Sci., London (1990)
4. K.M. Abraham and M. Alamgir, *J. Electrochem. Soc.*, **137**, 1657 (1990).
5. X. Sun, Y. Lin and X. Jing, *Solid State Ionics*, **83**, 79 (1996).