Study on life acceleration test for 20 Ah Li-ion pouch type batteries based on NMC(+)/LTO(-) electrode

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Lithium-ion rechargeable batteries have attracted many attentions due to their high specific energy, high efficiency and long life time [1, 2]. Recently, these batteries also start to find market dominating role as ideal electrochemical storage systems in power sources for renewable energy storage system as well as hybrid and electric vehicles [2, 3]. In the case of this application, reliable long-term life time is critical so increased research is being performed toward life time prediction as well as methodology of accelerated life test [4, 5].

In this study, a statistically designed accelerated life tests were performed under different extents of elevated temperature to predict life time of lithium ion battery including the study of capacity fade mechanism. Approximately 20 Ah pouch cells were assembled with $Li_4Ti_5O_{12}$(LTO) negative electrode and $Ni_4Co_2Mn_4$ (NCM) positive electrode. The pouch cells at temperatures of 25, 35, and 45 ˚C were cycled with 1 C rate including 30 min rest between charging and discharging process.

Based on experimental data, empirical life model of capacity degradation was determined and found to be applicable over a wide range of experimental conditions. In addition, to investigate the degradation mechanism of battery, surface microstructure and topography for both electrodes were investigated by field emission scanning electron microscopy (FE-SEM FEI Qunata 3D DualBeam). X-ray diffraction (XRD) patterns of electrodes were recorded on a Rigaku D/MAX-RC in the angular range of 10 – 80 ° with a 0.03 ° step. A θ/2θ coupled mode of XRD measurements were performed using Cu Kα radiation. Details on experiments and results will be presented in the conference.

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