Temperature Dependence of Nanoparticle Coating on Cathode Material

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Recently, surface modification of nanoparticles by using functional monolayer or polymer shells is reported to provide tailored surface properties of nanoparticles [1-3]. On the contrary, oxide-nanoparticle coating on the oxides or other inorganic compounds has been a technical challenge, and has not been reported in the open literature.

In this presentation, we report the temperature dependence of the nanoparticle coating on $LiCoO_2$ cathode material. After directly precipitating the nanoparticles with a particle distribution less than 5 nm in the water, they were coated on the $LiCoO_2$ powders with an average particle size of 10 μm, followed by drying at 120°C in an oven for 10 h. After firing the dried powders at various temperatures (400, 600, and 700°C) for 5 h, electrochemical properties of the nanoparticle-coated $LiCoO_2$ were investigated in coin-type half cells at 4.3, 4.6, and 4.8 V charge cut-offs. Preliminary cycling results showed that the coated powders heat-treated at 600°C had no capacity fading at 4.3 V charge cut-off at 1 C rate (= 140 mA/g), and superior capacity retention even at 4.8 V charge cut-off to bare $LiCoO_2$, as shown in Fig. 1.

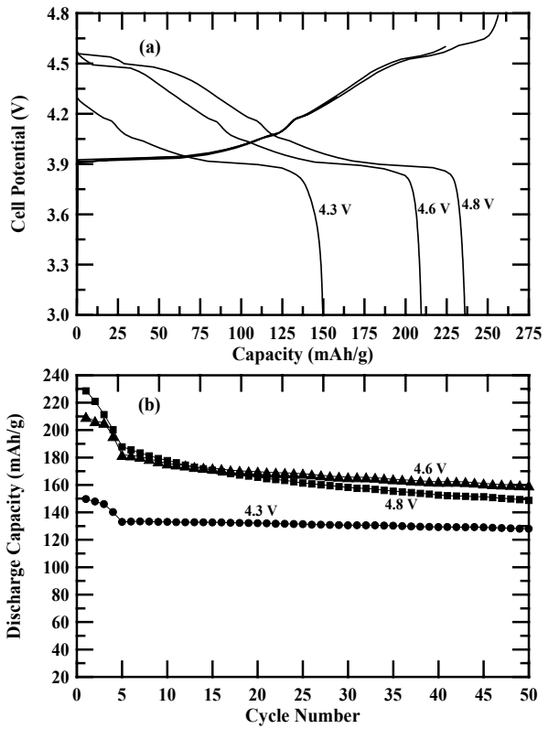

Figure 1. Plots of (a) voltage profiles of nanoparticle-coated $LiCoO_2$ with different cut-off voltages (4.3, 4.6, and 4.8 V), and (b) discharge capacity vs. cycle number.

References

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