Effect of Nanoparticle-Coating Thickness on the Electrochemical Properties in $LiCoO_2$ Cathode Material

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$LiCoO_2$ as a cathode material has been used widely in commercial Li-ion cells because of its good rate capability, good cycle life both at room and elevated temperatures, and high volumetric energy density. However, this is the case when the average particle size and charge cut-off voltage were 5 μm and 4.3 V, respectively. When the charge cut-off voltage and an average particle size were increased to 4.4 V and 10 μm, respectively, both rapid capacity fading and rate capability were observed. In order to overcome such problems, metal oxide (ZrO_2 and Al_2O_3) coating on $LiCoO_2$ was reported by Cho *et al.* [1-4]. However, dependence of metal-oxide coating thickness on the electrochemical properties could not be studied due to the difficulty in controlling coating thickness via sol-gel coating.

In this presentation, we will show the effect of nanoparticle-coating thickness in $LiCoO_2$ cathode material on the electrochemical properties for the first time. This nanoparticle coating can be done directly in aqueous solution, and the coating thickness can be controlled by increasing the concentration of nanoparticle coating solution. Nanoparticle-coated $LiCoO_2$ showed an excellent capacity retention even at 4.8 V charge cut-off voltage, and the electrochemical properties of coated samples strongly depend on the coating thickness.

References

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