BF4

아크리산을 사용한 $LiCoO_2$의 합성과 그 전기화학적 특성에 관한 연구

Synthesis of $LiCoO_2$ Using Acrylic Acid and its Electrochemical Properties for Li Secondary Batteries

유원섭, 김광범
연세대학교 금속공학과

Lithiated transition metal oxides have been extensively studied as cathode materials for commercial lithium-ion rechargeable batteries. Among those oxides, $LiCoO_2$ is most widely used as the cathode material of commercial secondary lithium batteries due to its advantages including easy preparation and high theoretical specific capacity.

A synthesis of $LiCoO_2$ is generally divided into two methods; a solid state method and a solution method. A solid state method consists of grinding and calcination of hydroxides or carbonates such as LiOH, Li_2CO_3 and $CoCO_3$. This method has disadvantages such as broader particle-size distribution, higher calcination temperature, longer reaction time. A solution method requires condensation of a solid oxide network starting from soluble species and a thermal treatment leading to oxide $LiCoO_2$. This method makes possible a better mixing of the elements and therefore a better reactivity of the mixture, which then allows lower reaction temperature and shorter reaction time. Additionally, the resulting powders also show good stoichiometric control and narrow particle size distribution.

Two preparation techniques have been reported as a solution method for synthesis of $LiCoO_2$. One is a synthesis of $LiCoO_2$ using a precipitation process in aqueous solutions of hydroxide, nitrates, and acetates salts. The other is a sol-gel process using organic acid as a chelating agent. In the sol-gel process, chelating agents previously reported have shown drawbacks such as fluffiness during calcination and need for pH control during the gel-formation. In this study, acrylic acid has been used as a chelating agent in order to overcome the disadvantages of the reported chelating agents. HT-$LiCoO_2$ can be synthesized at a wide temperature range in the sol-gel process. However, systematic investigation of electrochemical properties of $LiCoO_2$ powders synthesized by the sol-gel process at various temperatures has not been reported so far. In this study, $LiCoO_2$ powders were synthesized using acrylic acid as a chelating agent and their structural and electrochemical properties were studied as a function of calcination temperature by XRD, EXAFS, EVS, CV, and galvanostatic charge/discharge experiments.