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Studies on Bare and Mg-doped $LiCoO_2$ as a cathode material for Lithium ion Batteries

Abstract

In this paper, we report on the preparation of bare and Mg-doped Li(Mg xCo1-x)O2 (x = 0, 0.03, 0.05) phases by a molten salt method and their electrochemical properties. They were prepared at 800 °C for 6 h in air. Rietveld refined X-Ray Diffraction data of bare (x = 0) and Mg-doped (x = 0.03, 0.05) compounds show a well-ordered hexagonal layer-type structure (a ~ 2.81 Å, c ~ 14.05 Å). Scanning Electron Microscopy (SEM) show hexagonal type morphology at 800°C. Powder density was close to 5.02 gcm-3, which compares well with the theoretical value. Electrochemical properties were studied in the voltage range of 2.5-4.3 V vs. Li using Cyclic Voltammetry (CV) and galvanostatic cycling. CV studies on bare and Mg-doped LiCoO2 show main cathodic and anodic redox peaks at ~ 3.9 V and ~ 4.0 V, respectively. Galvanostatic cycling of Li(MgxCo1-x)O2 (x = 0, 0.03, 0.05) showed reversible capacity values at the 60th cycle to be: 147 (±3) mAh g-1 (x = 0), 127 (±3) mAh g-1 (x = 0.03), and 131 (±3) mAh g-1 (x = 0.05) cycled at a current density of 30 mA g-1. Capacity retention is also favourable at 98.5%..

Keywords — Cathode, electrochemical properties, molten salt method