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Synthesis and Electrochemical Characteristics of Lithium Nickel Manganese Oxide as Cathode Material for Lithium Ion Batteries

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Abstract: Lithium nickel manganese oxide $Li_xNi_{0.25}Mn_{1.75}O_4$ (LNMO, x ~ 0.5) was synthesized through a novel and facile electrodeposition technique, which was carried out in an acidic solution. Inductively coupled plasma (ICP) was used to determine the lithium content of each sample and the chemical formula of the composite cathode[1-2].The electrochemical characteristics of the calcined material was determined by electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV). CV was carried out in 3.5-5 V range with 1 mV s^{-1} scan rate and EIS was performed within a frequency range of 0.1 Hz to 100 kHz [3]. Coin cells were fabricated using a mixture of 85 wt.% of active material, 10 wt.% graphite and 5 wt.% PVDF in NMP as the cathode composite and a metallic lithium foil used as anode [4]. Nyquist plots were used to determine the ohmic (R_s) and charge-transfer resistance (R_{ct}) of the samples [5-6]. Results prove that the charge transfer resistance of the optimized synthetized material is about 123.91 Ω and the ohmic resistance is about 4.12 Ω. CV curves show two pairs of redox couples: one broad redox peak at about 4.0 V for Mn^{3+}/Mn^{4+} and a couple of rather sharper redox peaks at around 4.7 V for Ni^{2+}/Ni^{4+} of the cathode composite [7]. Results show that the synthesized composite can be a promising material to be used as a cathode material in lithium ion batteries.

Keywords: Lithium ion battery, cathode material, Lithium nickel manganese oxide.

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