

Electrochemical and Structural Studies of the LiCoO₂ Prepared by Combustion Synthesis

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LiCoO₂ powders were prepared by combustion synthesis, using metallic nitrates as oxidant and metal sources and urea as fuel. A small quantity of the LiCoO₂ phase was obtained directly by combustion reaction, however, heat treatment was necessary to phase crystallization. The heat treatment was performed of 400°C up to 700°C for 12h. The powders were characterized by X ray diffraction, scanning electronic microscopy and area specific values are obtained by BET isotherms. Composites were prepared using LiCoO₂, carbon black and polyvinylidene fluoride (PVDF) mixture in the ratio 85:10:5 performed in ethylene carbonate: dimethylcarbonate solution, using lithium perchlorate as supporting electrolyte. Cyclic voltammograms showed one reversible redox processes at 4.0V/3.85V and one irreversible redox process at 3.3V for LiCoO₂ obtained after post-heat treatment at 400°C and 500°C. Raman spectroscopy showed the possible presence of the LiCoO₂ with cubic structure for the material obtained at 400°C and 500°C. This result was agreed with structural refinement of the LiCoO₂ powders obtained at different temperatures using Rietveld method that showed the co-existence of the LiCoO₂ cubic (spinel) and rhombohedral (layered) structures when LiCoO₂ is obtained at lower temperatures (400°C and 500°C) and the only rhombohedral structure for LiCoO₂ obtained after post-heat treatment at 600°C. The maximum energy capacity in the first discharge was 136mAh⁻¹ for composite electrode based on LiCoO₂ obtained after heat treatment at 700°C.