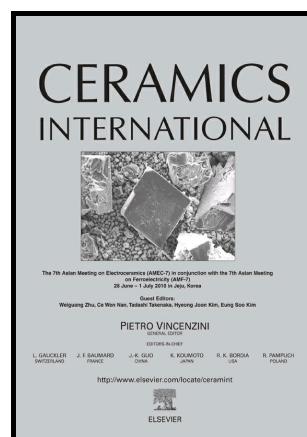


## Author's Accepted Manuscript

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PII: S0272-8842(17)30257-2  
DOI: <http://dx.doi.org/10.1016/j.ceramint.2017.02.071>  
Reference: CERI14687

To appear in: *Ceramics International*

Received date: 23 November 2016  
Revised date: 15 February 2017  
Accepted date: 15 February 2017

Cite this article as: Feng Xu, Hongge Yan, Jihua Chen, Mao He, Zhengfu Zhang Changling Fan and Gengshuo Liu, Improving electrochemical properties of  $\text{LiCoO}_2$  by enhancing thermal decomposition of Cobalt and Lithium carbonate to synthesize ultrafine powders, *Ceramics International*, <http://dx.doi.org/10.1016/j.ceramint.2017.02.071>

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**Improving electrochemical properties of LiCoO<sub>2</sub> by enhancing thermal decomposition of Cobalt and Lithium carbonates to synthesize ultrafine powders**

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**Abstract**

Ultrafine LiCoO<sub>2</sub> powders were directly synthesized by enhancing thermal decomposition of Cobalt and Lithium carbonates through a mechanochemical activation treatment to intensify the solid state diffusion reaction. Effects of activation treatment time on particle size and structure of the LiCoO<sub>2</sub> compound were investigated. In the present study, the optimum mechano-chemical activation time was found to be 10 h. In this study, the ultrafine LiCoO<sub>2</sub> powders (particle size in the range from 200 nm to 400 nm) show good structural stability and higher structural integrity. X-ray photoelectron spectroscopy (XPS) results indicate that most of Co cations exist as Co<sup>3+</sup>, which contributes to the improvement of the electrochemical performance. Cyclic voltammetry (CV) curves of different cycles display almost a complete overlap, which can be regarded as another evidence of the excellent cycle performance. The LiCoO<sub>2</sub> powders exhibit a high initial discharge specific capacity of 175.2 mAh/g at 0.1 C (274 mA/g at 1 C) and a remarkable cycle stability from 167.5 mAh/g to 146.2 mAh/g at 0.5 C and from 147.5 mAh/g to 115.2 mAh/g at 3 C after 100 cycles in the range of 3.3~4.3 V. The apparent activation energy and the frequency factor of the decomposition of CoCO<sub>3</sub> are 69.83 kJ/mol and  $1.369 \times 10^6$ , respectively, indicating that the

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