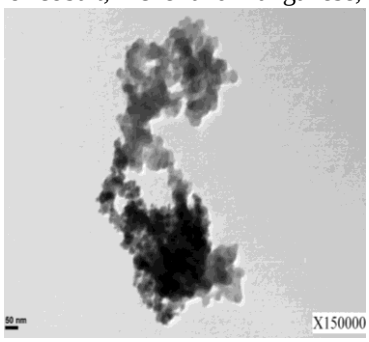
Hydrothermal Synthesis of Cathode Materials for Rechargeable Lithium-ion Battery

M.G. Ortiz[a,b], S. G. Real[a,b] , A. Visintin[a]
[a]*Instituto de Investigaciones Fisicoquímicas Teóricas y Aplicadas (INIFTA), Facultad de Ciencias Exactas, UNLP, CCT La Plata-CONICET, Suc. 4, C.C. 16, 1900 La Plata Argentina.*
[b] *Centro de Investigación y Desarrollo en Ciencia y Tecnología de los Materiales (CITEMA), Facultad Regional La Plata, Universidad Tecnológica Nacional (FRLP- UTN), Calle 60 y 124, La Plata, Argentina.*
e-mail: mortiz@inifta.unlp.edu.ar

The Lithium-ion batteries are electrochemical systems based on the use of intercalation compounds supported on porous structures with different characteristics. The Li-ion battery operates by intercalation of Li^+ cations in materials, for migration from the cathode to the anode. Different materials are used as cathode, for example, mixed oxides of transition metals ($LiMO_2$, where M: Mn, Co and / or Ni) [1-2], and lithium iron phosphate ($LiFePO_4$) [3] or other materials [4-5].

In this paper the preparation of Li-Ni-Co-Mn oxides by hydrothermal synthesis is presented; being a simple, low cost and low temperatures process; that produces highly homogeneous materials. A solution containing nitrate of cobalt, nickel and manganese, sodium hydroxide and lithium are used as precursor solution; this is introduced into an autoclave at 180°C. Then the precipitates that have been obtained are combusted in an oxygen atmosphere. Optical techniques (as DRX, SEM and TEM) are used to characterize the prepared material. The electrochemical performance of mixed oxides as active cathode materials in lithium-ion batteries are studied by electrochemical techniques such as charge-discharge cycles, galvanostatic discharge at different currents, cyclic voltammetry and electrochemical impedance spectroscopy.



[1] G. Amatucci, J. M. Tarascón; Journal of the Electrochemical Society 149 (2002) K31.
[2] Sun-Ho Kang, Daniel P. Abraham, Won-Sub Yoon, Kyung-Wan Nam, Xiao-Qing Yang; Electrochimica Acta 54 (2008) 684.
[3] A. K. Padhi, K. S. Nanjundaswamy; J. B. Goodenough; Journal of the Electrochemical Society 144 (1997) 1188.
[4] Long Qu, Shaohua Fang, Zhengxi Zhang, Li Yang, Shin-ichi Hirano; Materials Letters, 108 (2013) 1.
[5] Jiexin Dang, Feng Xiang, Ningyu Gu, Rongbin Zhang, Rahul Mukherjee, Il-Kwon Oh, Nikhil Koratkar, Zhenyu Yang; Journal of Power Sources, 243 (2013) 3.