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A SPRAY DRYING METHOD FOR THE PREPARATION OF Na_2FePO_4F/CB AND Na_2FePO_4F/CNT COMPOSITES CATHODE FOR LITHIUM-ION BATTERIES

A. Mahmoud[1], L. Berardo[1], M. Brisbois[1], S. Caes[1], A. Schrijnemakers[1], R. P. Hermann[2], R. Cloots[1], B. Vertruyen[1], F. Boschini[1]

[1]GREENMat, CESAM Research Unit, Institute of Chemistry B6, University of Liège, 4000 Liège, Belgium

[2]Materials Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA

abdelfattah.mahmoud@ulg.ac.be

Fluorophosphates are considered among the most interesting series of cathode material for Li/Na-ion batteries[1]. Na_2FePO_4F (space group Pbcn), with its layered structure and two-dimensional pathways for facile Na^+/Li^+ transport, exhibits minimal structural changes upon reduction/oxidation. The average working voltage is 3.3 V vs. Li/Li^+. Intercalation/deintercalation results in a volume change of only 3.7%. However, one of the key drawbacks of Na_2FePO_4F electrodes is their low intrinsic electronic conductivity.

In order to study the effect of the carbon black and carbon nanotubes on the electrochemical performance of Na_2FePO_4F cathode material for lithium-ion batteries, Na_2FePO_4F, Na_2FePO_4F/CB and Na_2FePO_4F/CNT were prepared by a spray-drying method with different ratios of CB and CNT (10 and 20%). The crystal and local structure were analyzed by XRD and Mössbauer spectroscopy. The electrochemical properties were studied by galvanostatic cycling in lithium cells. The electrochemical performance is markedly better in the case of Na_2FePO_4F/CNT (20 wt%), with specific capacities of about 100 mAh/g (Na_2FePO_4F/CNT) at C/4 rate[2] vs. 50 mAh/g for Na_2FePO_4F/CB. The characterization of Na_2FePO_4F/CB particles by electron microscopy revealed a carbon-poor surface and a good carbon dispersion for Na_2FePO_4F/CNT particles attributed to better diffusion of carbon nanotubes in the droplets during drying.

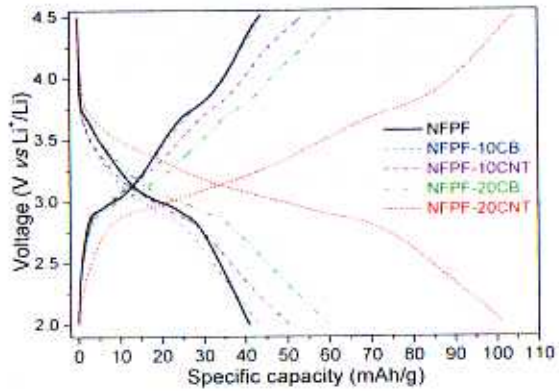

Fig. 1 Comparison of selected discharge/charge curves registered during the cycling of NFPF based electrode materials at C/10 at 25 °C in the voltage range of 2.0-4.5V.

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