Electrochemical performance of materials synthesized by flame-assisted spray pyrolysis

Kuan-Yu Shen[1], Miklos Lengyel[1], Gal Atlas[1], Dror Elhassid[2], William Moller[2], Richard L. Axelbaum*[1]

[1]Department of Energy, Environmental & Chemical Engineering, Washington University in Saint Louis
One Brookings Drive, Saint Louis, MO 63130

[2]X-tend Energy, LLC, 1005 North Warson Road, Suite 201 St. Louis, MO 63132 USA

Li_xMO_2 (M= Mn, Ni, Co) composite materials with layered structures have received attention as high-capacity, low cost, and safe cathode materials for lithium-ion batteries [1]. The conventional synthesis method for these materials is co-precipitation, which has challenges associated with scale up [2]. Therefore a spray pyrolysis synthesis was developed by this group as a scalable, low cost production method [3]. Due to the formation mechanism of the particles, the product contains hollow spheres, which cause low bulk density [4-5]. Recently, Washington University in St. Louis and X-Tend Energy, LLC developed a scaled-up spray pyrolysis process for the synthesis of non-hollow, solid lithium transition metal oxide materials [6]. The method at present is capable of producing high quality battery materials at close to 50 gram/hour scale. In the present study layered Li_xMO_2 (M= Mn, Ni, Co) materials, spinel $LiMn_2O_4$ and similar oxides are produced and their electrochemical properties discussed:

Fig. 1 shows the XRD spectrum of $Li_{1.2}Mn_{0.53}Ni_{0.13}Co_{0.13}O_2$. The material is phase pure and the spectrum is typical for the $Li_{1.2}Mn_{0.53}Ni_{0.13}Co_{0.13}O_2$ material. Fig. 2 shows the cycle performance of $Li_{1.2}Mn_{0.53}Ni_{0.13}Co_{0.13}O_2$ at C/10 and C/3 rate. The material displays capacities in excess of 200 mAhg-1 after 100 cycles at 22°C. The results indicate that the material synthesized by flame assisted spray pyrolysis demonstrate excellent electrochemical performance and the method is a promising technique for synthesizing battery cathode materials in a scalable process.

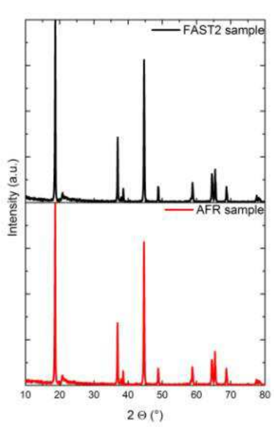

Figure 1 XRD pattern of $Li_{1.2}Mn_{0.53}Ni_{0.13}Co_{0.13}O_2$.

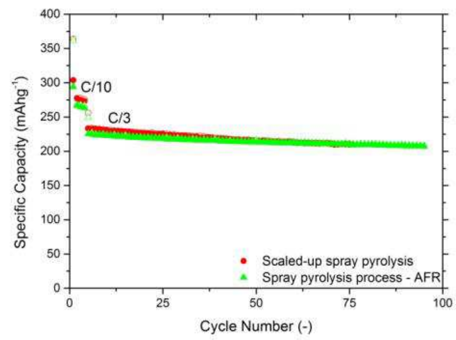

Figure 2 Cycle test results of $Li_{1.2}Mn_{0.53}Ni_{0.13}Co_{0.13}O_2$ synthesized via flame assisted spray pyrolysis.

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[1] *Corresponding author email: axelbaum@wustl.edu