Study on Surface Fluorination of Li-rich Layered Material $Li_{1.15}Ni_{0.17}Co_{0.11}Mn_{0.57}O_2$

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Novel cathode materials with higher capacities and cyclability are urgently needed [1]. With a wide range of operating voltage (2.0-4.8V), a huge capacity (over 250 mAh/g) nearly twice as that of $LiCoO_2$ and a low cost as that of $LiMn_2O_4$, the Li-rich layered oxide materials is believed to be a promising cathode material for lithium ion batteries [2]. However, its practical application is limited by the initial irreversible capacity loss, poor rate capability and cyclability [3].

In this work, we develop a facile method to fluorinate $Li_{1.15}Ni_{0.17}Co_{0.11}Mn_{0.57}O_2$ with different temperatures. It's found that the initial coulombic efficiency, discharge capacity and cyclability of the material are significantly improved after surface fluorination. As shown in Figure 1a, surface fluorination significantly improved the discharge capacity and cyclability of Li-rich layered material, in which the material fluorinated at 400 °C delivers the highest discharge capacity and capacity retention. Besides, the rate performance of $Li_{1.15}Ni_{0.17}Co_{0.11}Mn_{0.57}O_2$ at small rates (0.1C, 0.2C, 0.3C and 0.5C) has been improved by surface fluorination (Figure 1b).

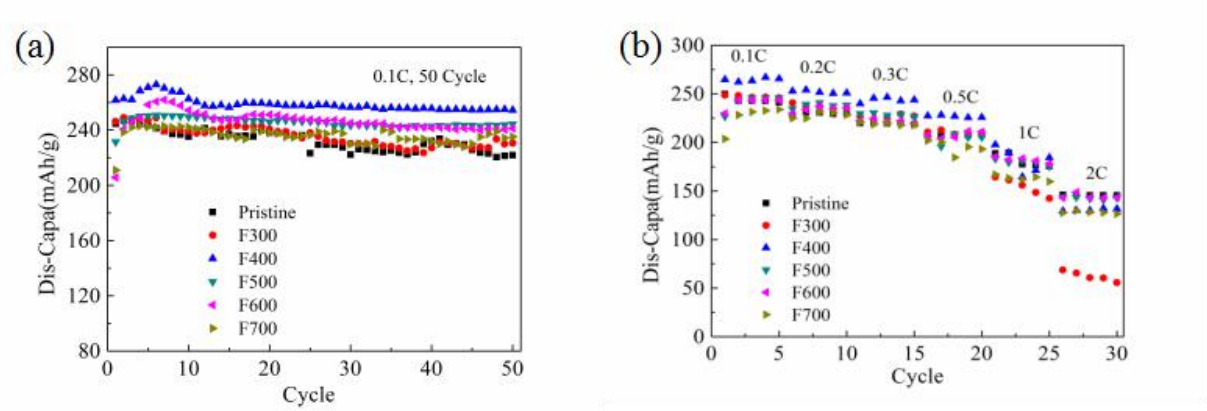

Figure 1 Cyclic performance (a) and rate performance (b) of pristine material and materials fluorinated at different temperatures.

References:

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[3] M.M. Thackeray, S.H.Kang, S.A. Hackney, et al. *Electrochem. Commun*., 2008, :1531-1538.