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Nano-sized lithium-rich cathode $0.4Li_2MnO_3$ $0.6Li[Ni_{1/3}Mn_{1/3}Co_{1/3}]O_2$ prepared by resorcinol-formaldehyde assisted sol-gel method

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Recently, layered lithium-rich cathode materials, xLi_2MnO_3 (1-x)$LiMO_2$(M=transition metal) have been considered as one of the most promising cathode materials due to their high specific capacity (200-300 $mAhg^{-1}$) and high operating voltage. However, lithium-rich cathode materials still suffer from several major defects, such as low coulomb efficiency, the poor long-term capacity retention, and the inferior rate performance. As we know, nano-sized cathode is an effective method, the nano dimension provided more active surface sites for lithium storage, and also shortened the lithium-diffusion pathways, and these could improve electrochemistry performance. Herein, we prepared nano particle lithium-rich layered $0.4Li_2MnO_3$$0.6Li[Ni_{1/3}Mn_{1/3}Co_{1/3}]O_2$ by resorcinol-formaldehyde assisted sol-gel method. Nano-sized lithium-rich cathode presented excellent cycling performance. It showed a high initial discharge capacity of 256.8mAh g^{-1} and an initial coulomb efficiency of 78.9%. The discharge capacity after 50 cycles was 240.2mAh g^{-1} with capacity retention of 93.5% due to more active surface sites and shortens lithium-diffusion pathways of nanoparticles. Figure 1(a)(b) demonstrate its SEM images. Lithium-rich nanoparticles are about 250 nm-300 nm. Figure 1(c) showed the XRD pattern, it formed the good layered crystallizability. Figure 1(d) demonstrates, it has good capacity retention. These results indicate the nano-sized lithium-rich cathode could effectively suppress capacity attenuation and enhance coulomb efficiency and cycling performance.

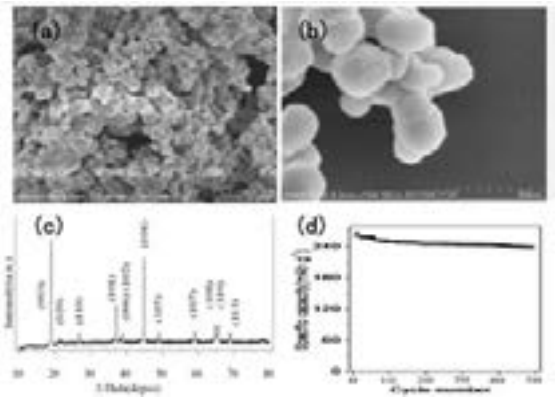

Figure 1: (a) (b) SEM, (c) XRD and (d) cycling performance (0.1C rate) of $0.4Li_2MnO_3$ $0.6Li[Ni_{1/3}Mn_{1/3}Co_{1/3}]O_2$ nanoparticles

Biography

Yujie Li studies energy materials and their electrochemistry, including synthesis of cathode material, anode material, and all-solid lithium battery as well as their applications in lithium storage and conversion. He received his Bachelor's degree in Materials Chemistry at Lanzhou University, China in 2003; Master's degree in Materials Physics Chemistry in 2006 and; Doctor's degree in Materials Science & Engineering in 2010 at National University of Defense Technology, China. He is now an Assistant Professor in Department of Materials Science & Engineering at National University of Defense Technology, China.

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