Accepted Manuscript

Li-rich nanoplates of $Li_{1.2}Ni_{0.13}Co_{0.13}Mn_{0.54}O_2$ layered oxide with exposed {010} planes as a high-performance cathode for lithium-ion batteries

Jili Li, Chunying Xu, Junwei Zhao, Jian Chen, Chuanbao Cao

PII: S0925-8388(17)33721-0

DOI: 10.1016/j.jallcom.2017.10.285

Reference: JALCOM 43682

To appear in: *Journal of Alloys and Compounds*

Received Date: 8 March 2017

Revised Date: 29 October 2017

Accepted Date: 30 October 2017

Please cite this article as: J. Li, C. Xu, J. Zhao, J. Chen, C. Cao, Li-rich nanoplates of $Li_{1.2}Ni_{0.13}Co_{0.13}Mn_{0.54}O_2$ layered oxide with exposed {010} planes as a high-performance cathode for lithium-ion batteries, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.10.285.

Li-rich nanoplates of $Li_{1.2}Ni_{0.13}Co_{0.13}Mn_{0.54}O_2$ layered oxide with exposed {010} planes as a high-performance cathode for lithium-ion batteries

Jili Li,[a]* Chunying Xu,[b] Junwei Zhao,[a] Jian Chen,[a] Chuanbao Cao[c]

a. Department of Material Science and Engineering, Luoyang Institute of Science and Technology, Luoyang 471023, China.

b. College of Chemistry and Chemical Engineering, Henan Key Laboratory of Function-Oriented Porous Materials, Luoyang Normal University, Luoyang 471934, China.

c. Research Center of Materials Science, Beijing Institute of Technology, Beijing 100081, China.

* Corresponding Author. E-mail address: lijili328@126.com, Tel.: +86(0379)65928196;

Fax: +86(0379)65928196

Abstract: The layered lithium-rich cathode material $Li_{1.2}Ni_{0.13}Co_{0.13}Mn_{0.54}O_2$ crystallizes with an α-$NaFeO_2$ structure, through which Li^+ ions are transported along two-dimensional channels. In this work, nanoplates of $Li_{1.2}Ni_{0.13}Co_{0.13}Mn_{0.54}O_2$ (NP-LNCMO) with exposed {010} planes are successfully synthesized. The formation of open structures provides unimpeded paths for Li^+ ion intercalation/deintercalation. The synthesis involves the use of ethylene glycol with two hydroxyl groups as the solvent, which can also react with the transition metal ions to yield plate-like structures with exposed {010} planes. NP-LNCMO displays a high specific discharge capacity of 288.9 mAh g^{-1} at 0.1 C (1 C = 300 mA g^{-1}) and an excellent rate capability (a discharge capacity of 109.7 mAh g^{-1} at 15 C). Furthermore, negligible voltage decay occurs during 50 charge/discharge cycles. The excellent electrochemical performance of NP-LNCMO can be attributed to the formation of nanoplates with exposed electrochemically active {010} planes.