

Supporting Information

Enhanced electrochemical performance of bulk type oxide ceramic lithium battery enabled by interface modification

Ting Liu^{a,b}, Yibo Zhang^a, Xue Zhang^a, Lei Wang^c, Shi-Xi Zhao^b, Yuan-Hua Lin^a, Yang
Shen^a, Jun Luo^c, Liangliang Li^{a,*}, Ce-Wen Nan^{a,*}

^a State Key Laboratory of New Ceramics and Fine Processing, School of Materials
Science and Engineering, Tsinghua University, Beijing 100084, People's Republic of
China

^b Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, People's
Republic of China

^c Center for Electron Microscopy, Tianjin Key Laboratory of Advanced Porous
Functional Materials, Institute for New Energy Materials & Low-Carbon
Technologies, School of Materials Science and Engineering, Tianjing University of
Technology, Tianjin 300384, People's Republic of China

*Corresponding author e-mail: liliangliang@mail.tsinghua.edu.cn

Phone: +86-10-62797162

Fax: +86-10-62771160

Postal address: State Key Laboratory of New Ceramics and Fine Processing, School
of Materials Science and Engineering, Tsinghua University, Beijing 100084, People's
Republic of China

*Corresponding author e-mail: cwnan@mail.tsinghua.edu.cn

Phone: +86-10-62773587

Fax: +86-10-62771160

Postal address: State Key Laboratory of New Ceramics and Fine Processing, School
of Materials Science and Engineering, Tsinghua University, Beijing 100084, People's
Republic of China

TEM images of LLZO-Ta

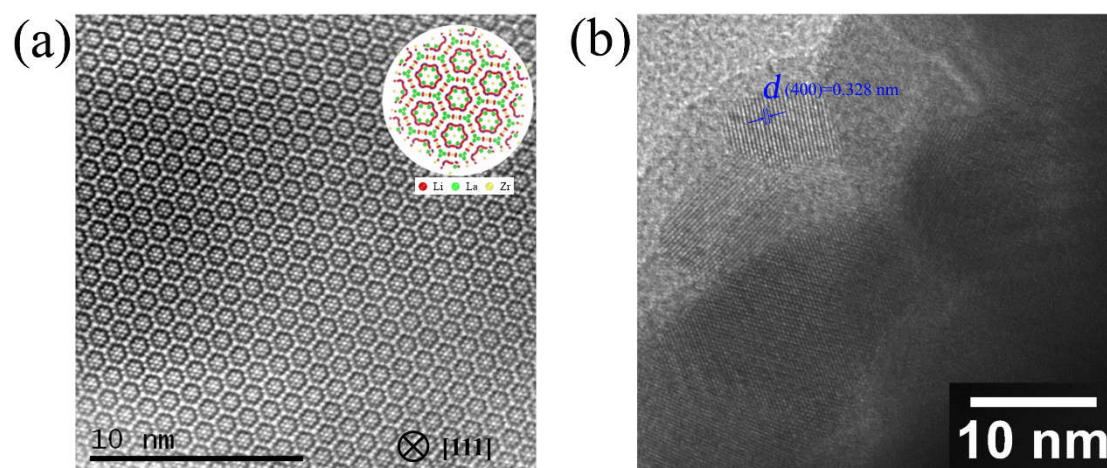


Figure S1. (a) Atomic-resolution high-angle annular bright-field (HAABF) STEM image of a LLZO-Ta pellet. The [111] zone axis of the sample was tilted to the electron beam direction to obtain this image. The inset was the atomic arrangement of the garnet crystal structure in the direction of [111]. (b) High-resolution TEM image of LLZO-Ta powder. The lattice fringes are corresponding to (400) crystal planes.

XRD of surface-modified cathode powder

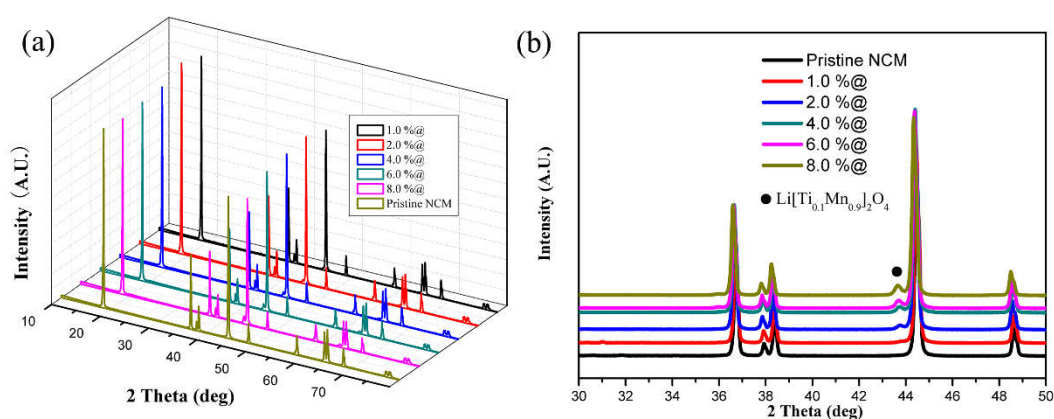


Figure S2. (a) XRD patterns of the pristine and surface-modified $\text{Li}[\text{Ni}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}]\text{O}_2$ powder. The amount of the precursor $\text{Li}(4)\text{-Ti}(5)\text{-O}(12)$ varied from 0 to 8.0 % to the weight of NCM powder. (b) Magnified spectra from 30 to 50 °.

All the samples exhibit a hexagonal phase with a space group of $R\bar{3}m$. No difference is observed between the pristine and coated NCM powder, indicating that the coating does not affect the main structure of NCM. The magnified spectra in Fig. S2(b) show tiny reflection peaks at 43–44°, which are attributed to $\text{Li}[\text{Ti}_{0.1}\text{Mn}_{0.9}]\text{O}_4$ (JCPDS card No. 88-1032).