

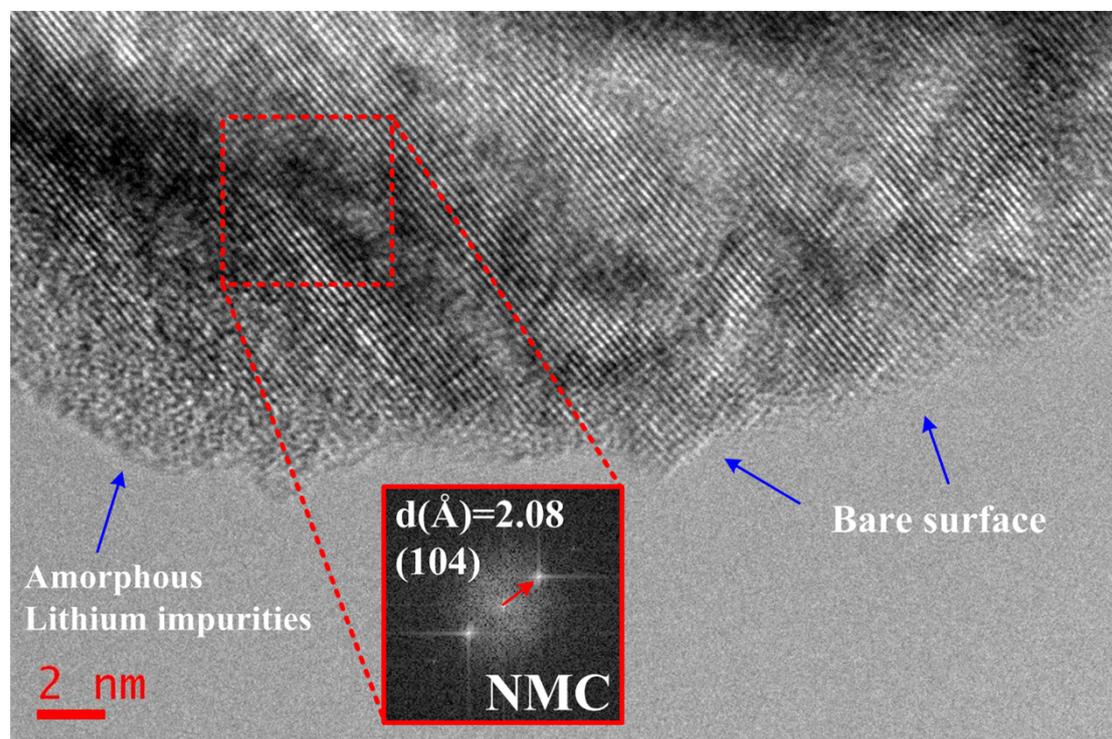
## Supporting Information

### A Hydrolysis-Hydrothermal Route to Synthesis of Ultrathin LiAlO<sub>2</sub>-inlayed LiNi<sub>0.5</sub>Co<sub>0.2</sub>Mn<sub>0.3</sub>O<sub>2</sub> as High Performance Cathode Material for Lithium Ion Batteries

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**Fig. S1** HRTEM image and corresponding FFT map of pristine powders after hydrothermal and calcination processes.

Considering that the structure of  $\text{LiAlO}_2$  resembles that of NMC, a comparison experiment has been performed to further identify the phase of coating layer. The fresh NMC powders, deionized water and absolute ethanol are added into the Teflon-lined autoclave to process a same hydrothermal and calcination treatment. The HRTEM image and corresponding FFT map of the synthesized powder are shown in the Fig. S1. It is obvious that the bulk is  $\text{LiNi}_{1-x-y}\text{Co}_x\text{Mn}_y\text{O}_2$  phase, while the formal and crystalline coating layer is missed, which indicates that the NMC cannot form coating layer via the same hydrothermal process.

Moreover, the EDS results in Fig 3l and Fig. 6, the XRD pattern and TEM image of  $\text{LiAlO}_2$  in Fig.1 combining with the similar nanosheet image in Fig. 4f further proved that the surface crystalline coating layer is  $\text{LiAlO}_2$  rather than NMC.