

Electronic Supplementary Information

Graphene-Oxide-Coated $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ as High Voltage Cathode for Lithium Ion Batteries with High Energy Density and Long Cycle Life

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Cyclic voltammetry (CV) test of the electrolyte system $\text{LiPF}_6@EC+DMC$

Stability of the electrolyte system $\text{LiPF}_6@EC+DMC$ was tested with cyclic voltammetry (CV) and the curve is shown in Figure S1a. To do this test, CR2032 coin cells were assembled with bare Al current collector as cathode and lithium foil as counter electrode. The scan rate is 0.05 mV/s and the scan range is 3.0 V to 5.0 V as what was used in the CV tests of the graphene-oxide-coated $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$. In this way, all the conditions are kept the same except the cathode, so it is reasonable to put the curve of the electrolyte and the curve of the cathode (shown in Figure S1b here and Figure 4b in the main text) into comparison.

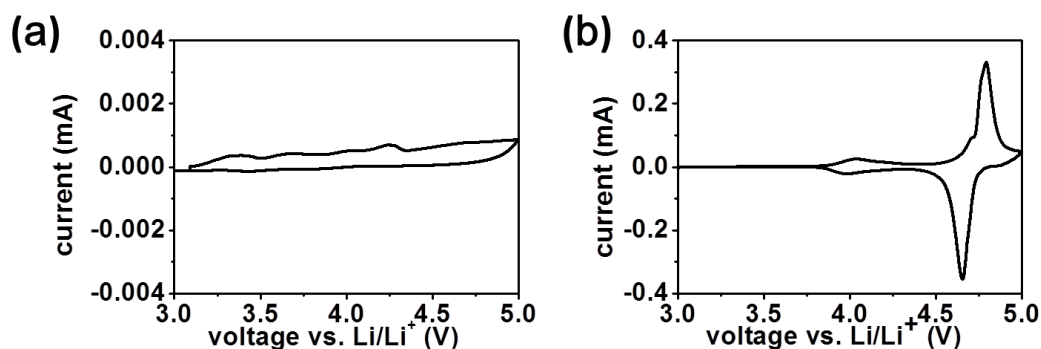


Fig. S1(a) CV curve of $\text{LiPF}_6@EC+DMC$. (b) CV curve of graphene-oxide-coated $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$, the same as Figure 4b in the main text.

In the CV test of $\text{LiPF}_6@EC+DMC$, small current was detected in the voltage range of 3-5 V, meaning that the electrolyte system may have slightly decomposed during the test. It is also possible that other side reactions may happen in this high voltage range. However, if we compare the CV curve of the electrolyte with the CV curve of graphene-oxide-coated $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ shown in Figure S1b, we can see that the current from the decomposition of electrolyte is at least two orders of magnitude smaller than the current from the electrochemical reaction of graphene-oxide-coated $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$. In this regard, it is evident that only negligible side reactions were detected and no obvious electrochemical reaction happened in the electrolyte system of $\text{LiPF}_6@EC+DMC$. As this is the electrolyte system widely used in high voltage cathode $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_4$ research, we believe the stability is acceptable and the result presented in this paper is comparable with results from literature.