Supporting Information for

Graphene liquid cell electron microscopy of initial lithiation in Co_3O_4 nanoparticles

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Supporting Figures

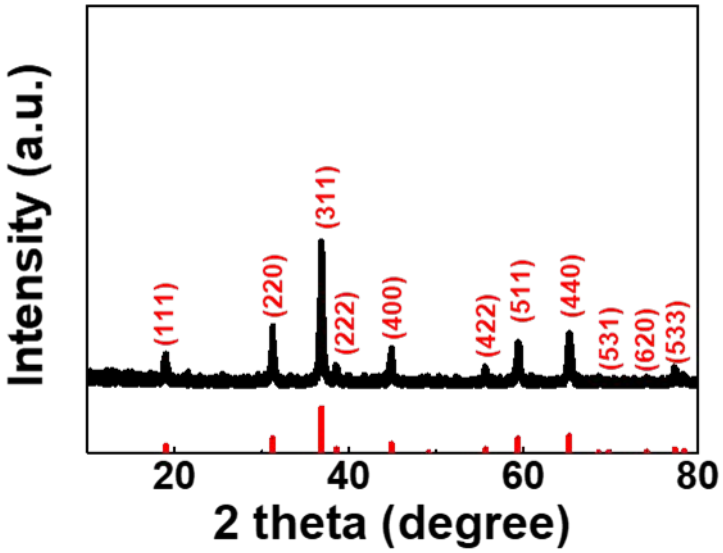

Figure S1. XRD pattern of pristine Co_3O_4 nanoparticles. The crystal structure well matched with Co_3O_4 (JCPDS #42-1467).

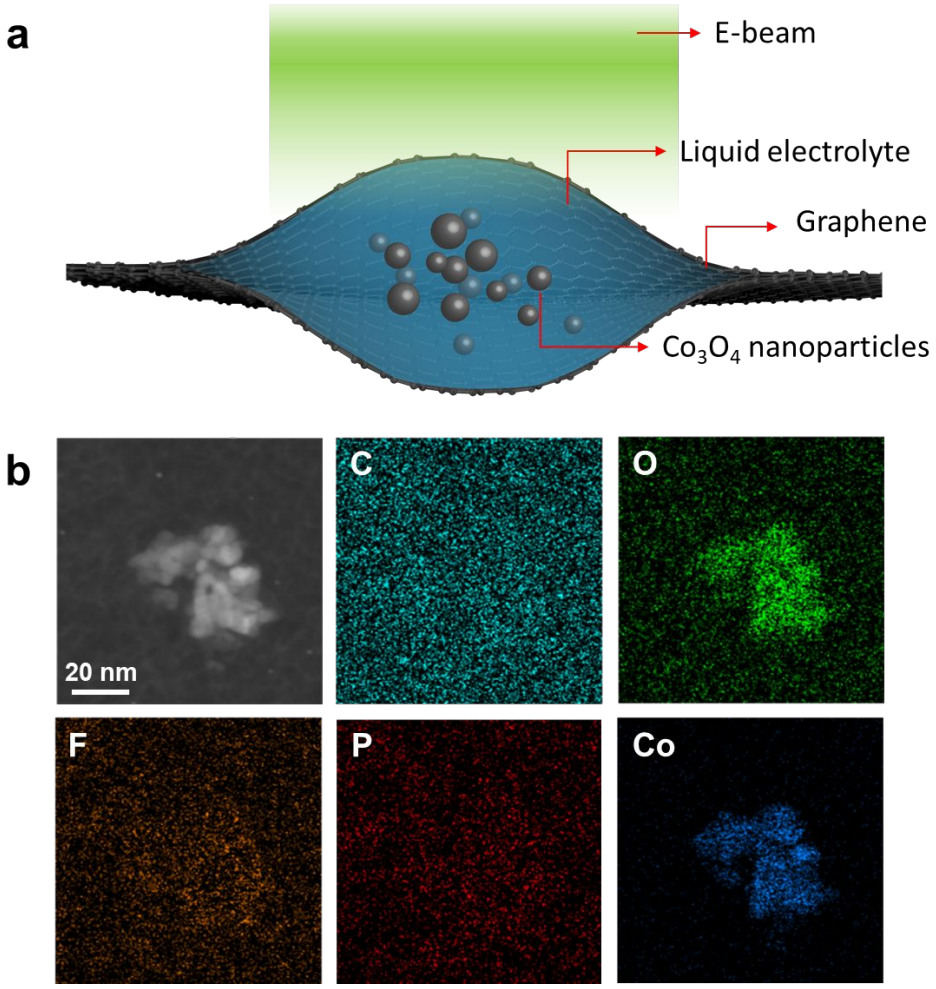

Figure S2. (a) Schematic diagram of GLC, consisting of two graphene sheets, liquid electrolyte, and Co_3O_4 nanoparticles. (b) HAADF-STEM image of Co_3O_4 nanoparticles inside the GLC and corresponding STEM-EDS mapping of C, O, F, P, and Co.

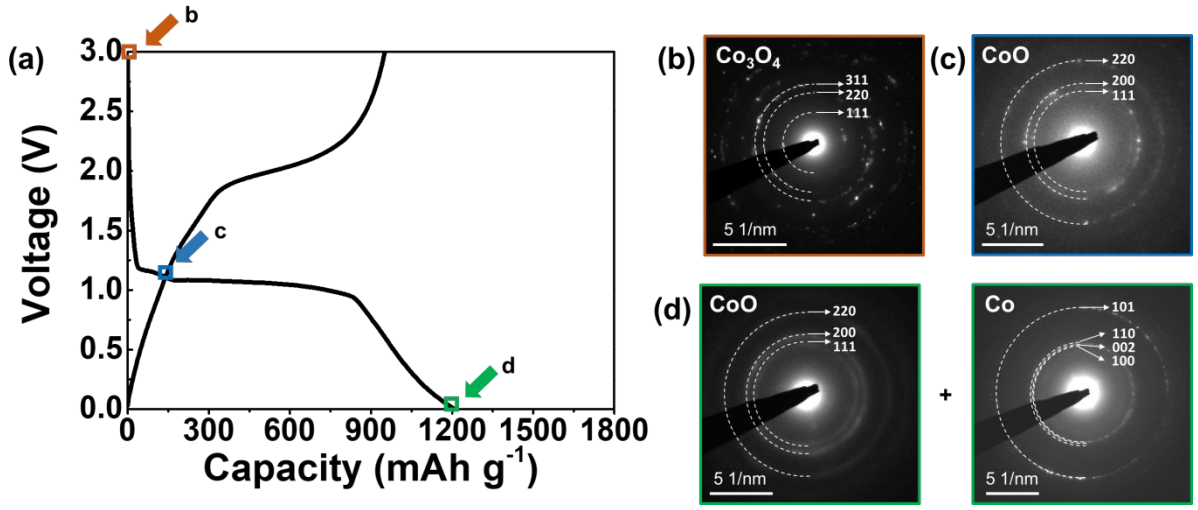

Figure S3. (a) Galvanostatic charge-discharge profile of 1st cycle. (b, c ,d) corresponding *ex situ* SAED patterns marked as brown, blue and green arrows in (a).

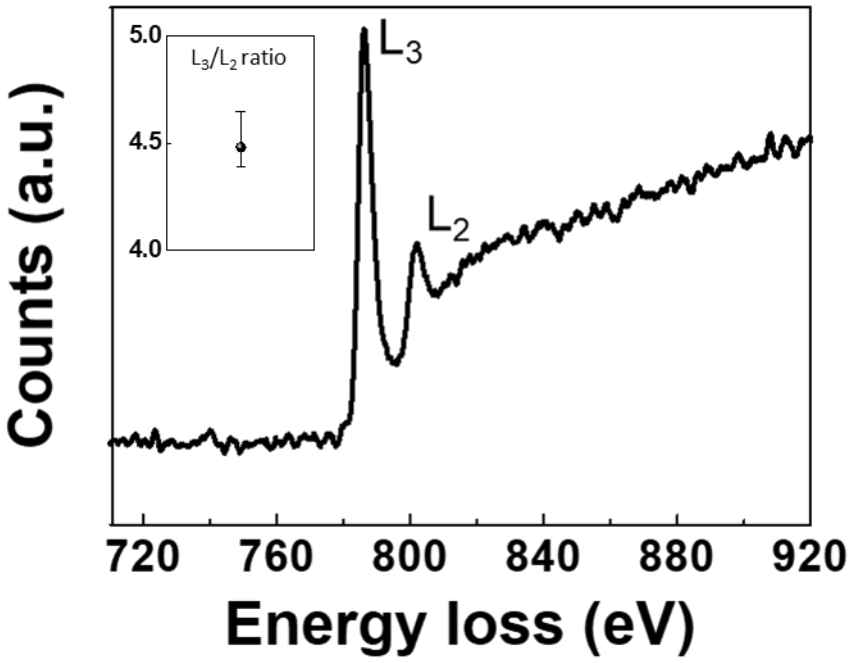

Figure S4. EELS spectrum of Co-$L_{2,3}$ edge from *ex situ* experiment, at 1.2 V in Figure S3 (inset: ratio between L_3/L_2 peaks).

Supporting Movie

Movie S1. Real-time TEM movie showing lithiation of Co_3O_4 nanoparticles in GLC (x4 faster).