

Figure S1. XRD pattern for (NH₄)Co₈(CO₃)₆(OH)₆•4H₂O sheet-like precursor.



Figure S2. Raman spectra of SG@LFCPO



Figure S3. Atomic force microscopy (AFM) images of a) (NH₄)Co₈(CO₃)₆(OH)₆•4H₂O sheet-like precursor, b) SG@LFCPO.



Figure S4. a) SEM image of LiCoPO₄ nanomesh, b) TEM image of $(NH_4)Co_8(CO_3)_6(OH)_6$ •4H₂O sheet-like precursor, c) TEM image of LiCoPO₄ nanomesh, d) Nitrogen adsorption-desorption isotherm and the corresponding pore size distribution (inset) of LiCoPO₄ nanomesh.



Figure S5. The dot mapping images of SG@LFCPO.



Figure S6. XPS spectra of a) C1s, b) O1s, c) P2p, d) Fe2p and e) Co3p for SG@LFCPO after calibrating by C1s.



Figure S7. a) cyclic voltammetry (CV) of SG@LFCPO, b) the discharge capacity of galvanostatic measurement for SG@LFCPO and LiCoPO₄ nanomesh, c) the discharge capacity, d) the rate performance of SG@LFCPO at 0, 25 and 50 $^{\circ}$ C.



Figure S8. The SEM image of SG@LFCPO after electrochemical testing.



Figure S9. Niquist plots and the equivalent circuit images (inset illustration) of SG@LFCPO and LiCoPO₄ nanomesh.