Supporting Information

Multi-Functional Surface Engineering for Li-excess Layered Cathode Material Targeting Excellent Electrochemical and Thermal Safety Properties

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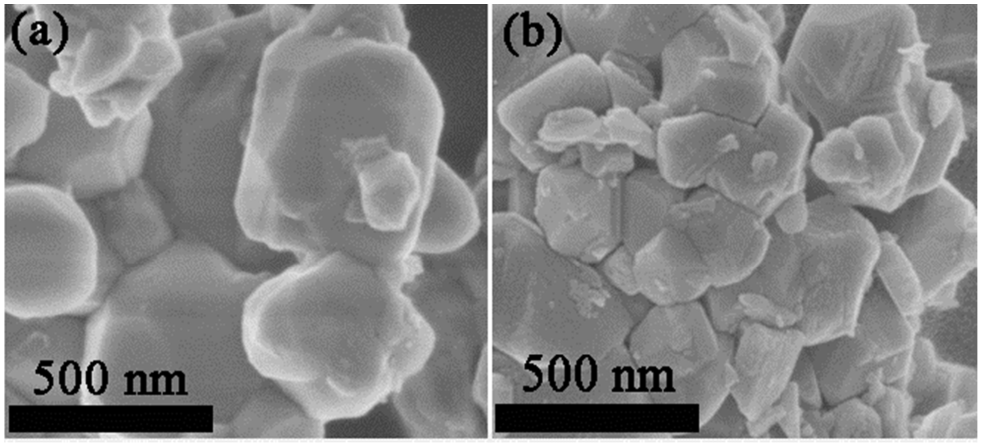

Figure S1. FESEM images of the (a) LLMO and (b) LLMO@$Li_4M_5O_{12}$@BiOF samples.

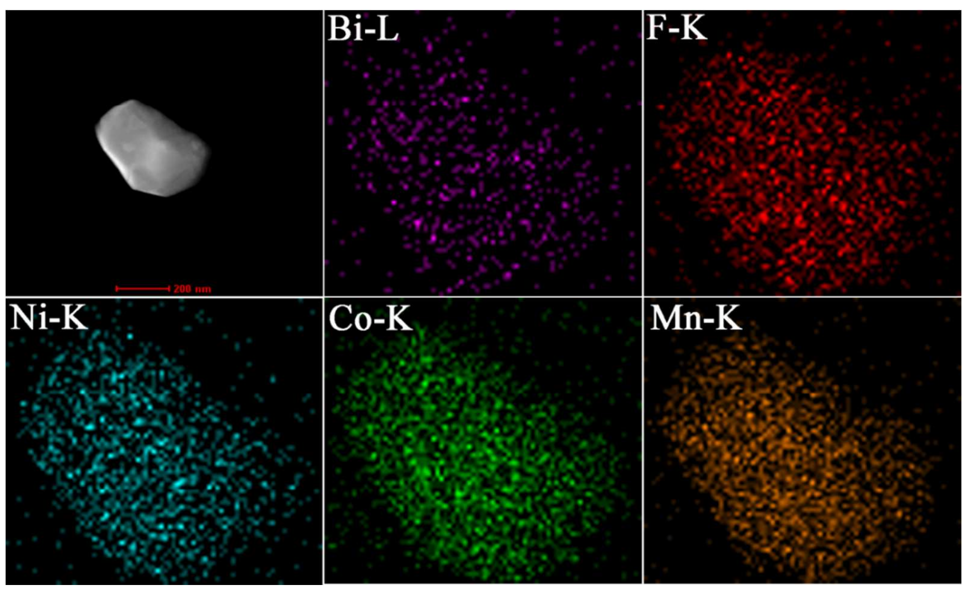

Figure S2. Ni, Co, Mn, Bi and F elmental mappings of the LLMO@$Li_4M_5O_{12}$@BiOF sample.

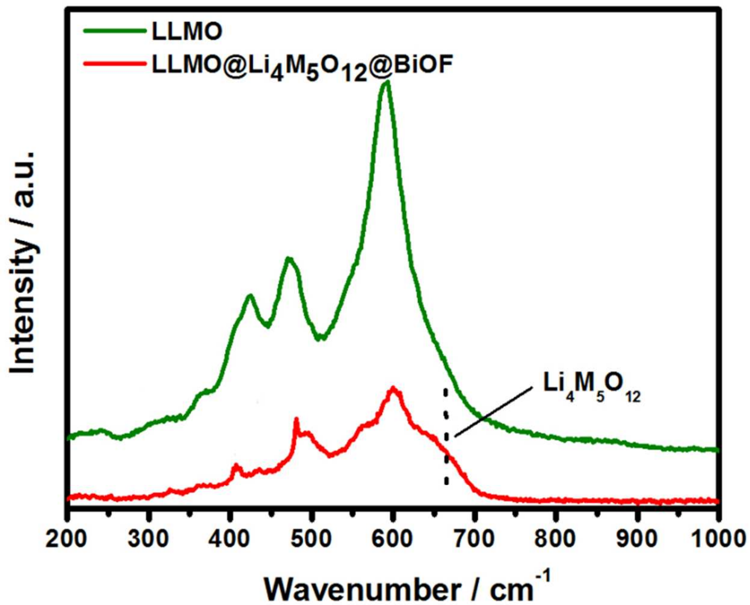

Figure S3. Raman patterns of the LLMO and LLMO@$Li_4M_5O_{12}$@BiOF samples.

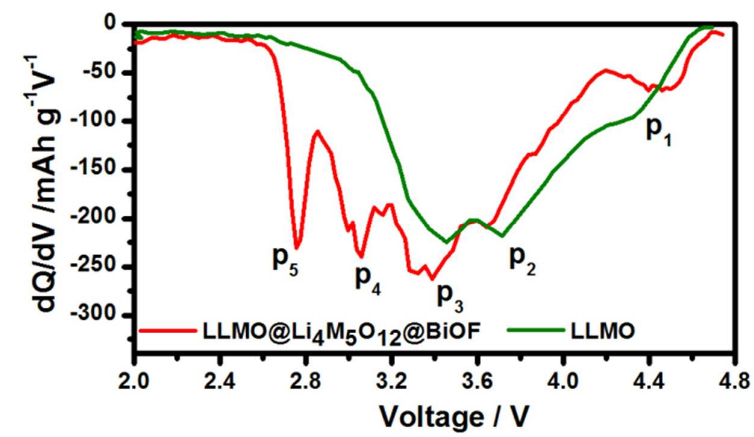

Figure S4. dQ/dV profiles of the LLMO and LLMO@$Li_4M_5O_{12}$@BiOF samples during the first discharge.

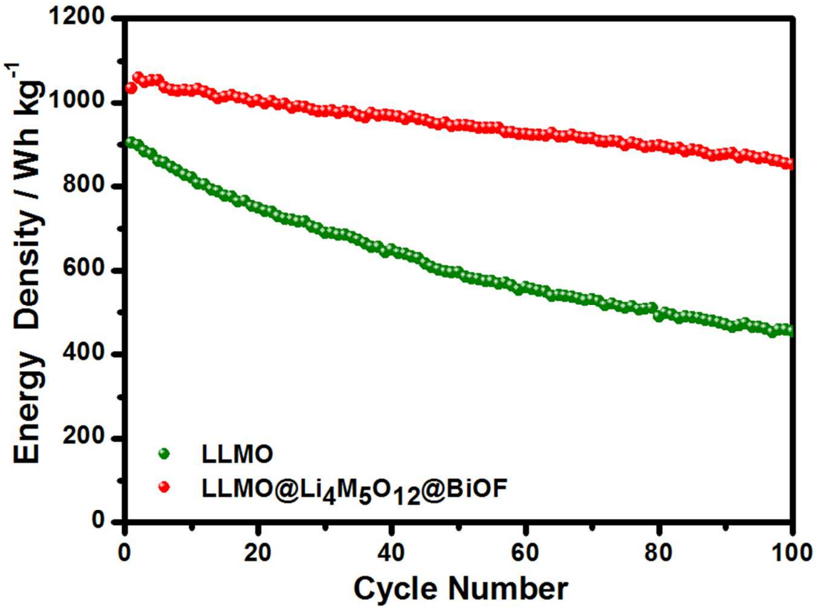

Figure S5. Specific energies of the LLMO and LLMO@$Li_4M_5O_{12}$@BiOF samples at the 0.2 C rate.

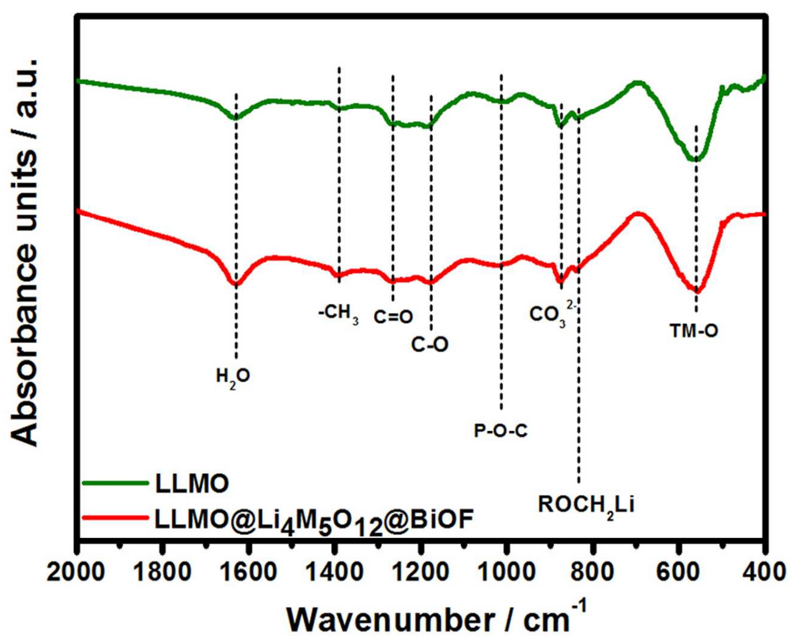

Figure S6. FTIR patterns of the LLMO and LLMO@$Li_4M_5O_{12}$@BiOF materials after three cyelces.

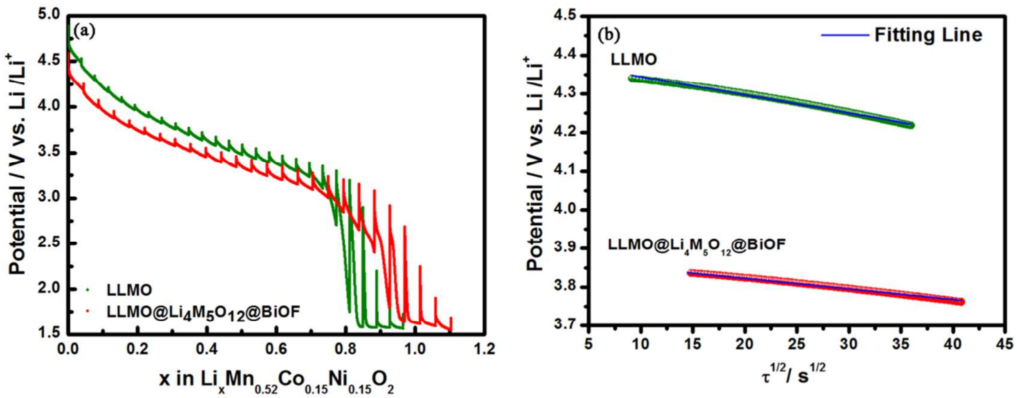

Figure S7. (a) GITT curves of the LLMO and LLMO@$Li_4M_5O_{12}$@LBO samples during the first discharge; (b) a typical E *vs.* $\tau^{1/2}$ profile of the samples for a single titration.

If the E *vs.* $\tau^{1/2}$ relationship shows a linear behavior over the entire time period of current flux, the lithium diffusion coefficients (D_{Li}) of the samples can be calculated by the following equation, [1]

$$D_{Li^+} = \frac{4}{\pi\tau}\left(\frac{mV_M}{MA}\right)^2\left(\frac{\Delta E_s}{\Delta E_\tau}\right)^2$$

where M and m are the molecular weight and mass of the cathode material, respectively. V_m is the molar volume of the active material, F is the Faraday constant and A is the BET surface area of the materials.

References

[1] Rui, X. H.; Ding, N.; Liu, J.; Li, C.; Chen, C. H., Analysis of the Chemical Diffusion Coefficient of Lithium Ions in $Li_3V_2(PO_4)_3$ Cathode Material. *Electrochim. Acta* **2010, 55**, 2384-2390.