**Supporting Information**

# A novel "holey-LFP / graphene / holey-LFP" sandwich nanostructure with significantly improved rate capability for lithium storage

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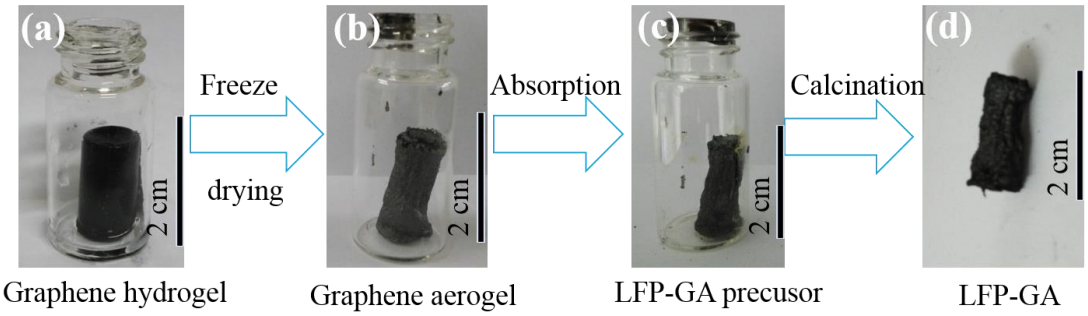


**Figure S1.** The digital photograph illustration of the synthesis of LFP-GA: (a) Graphene hydrogel synthesized by a hydrothermal process; (b) graphene aerogel obtained after the freeze drying; (c) LFP colloidal was adsorbed on graphene aerogel and dried to form the LFP-GA precursor; (d) The LFP-GA composite materials were obtained by calcination.

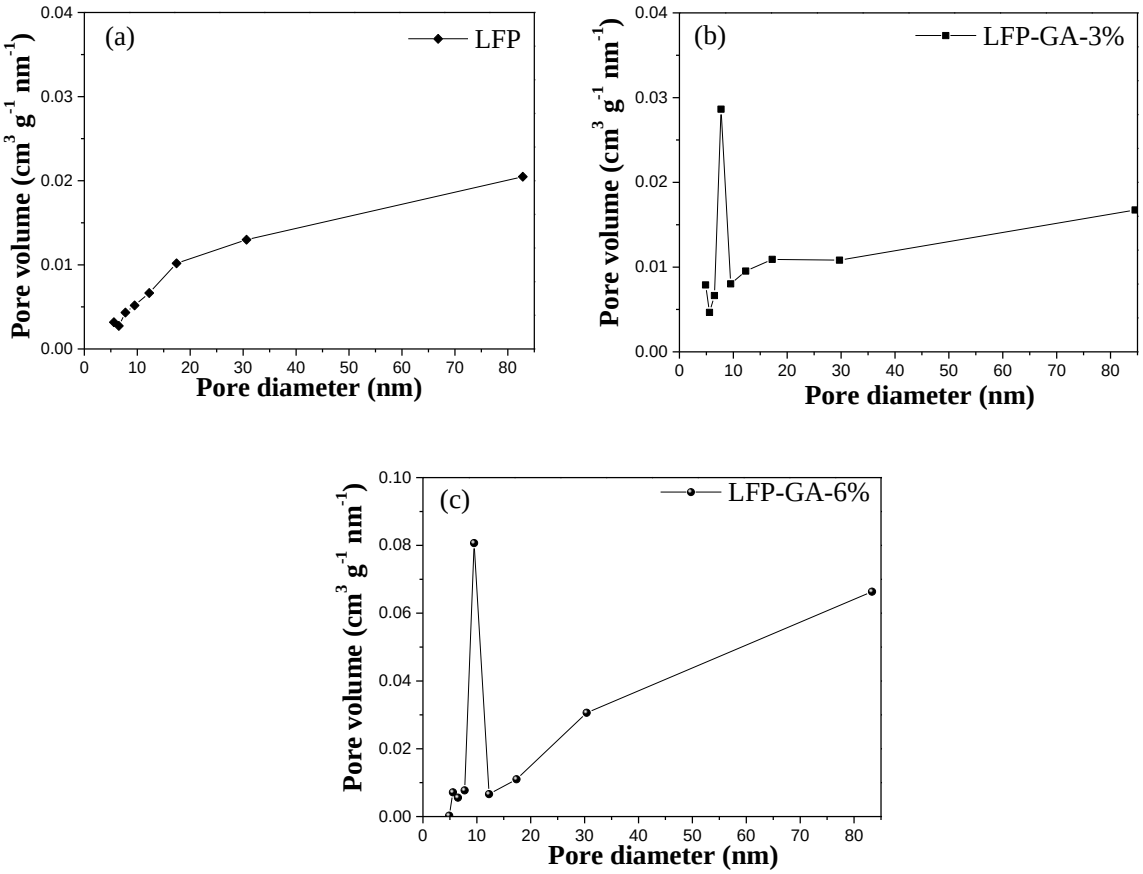


**Figure S2.** Pore-size distributions of (a) LFP, (b) LFP-GA-3% and (c) LFP-GA-6%.

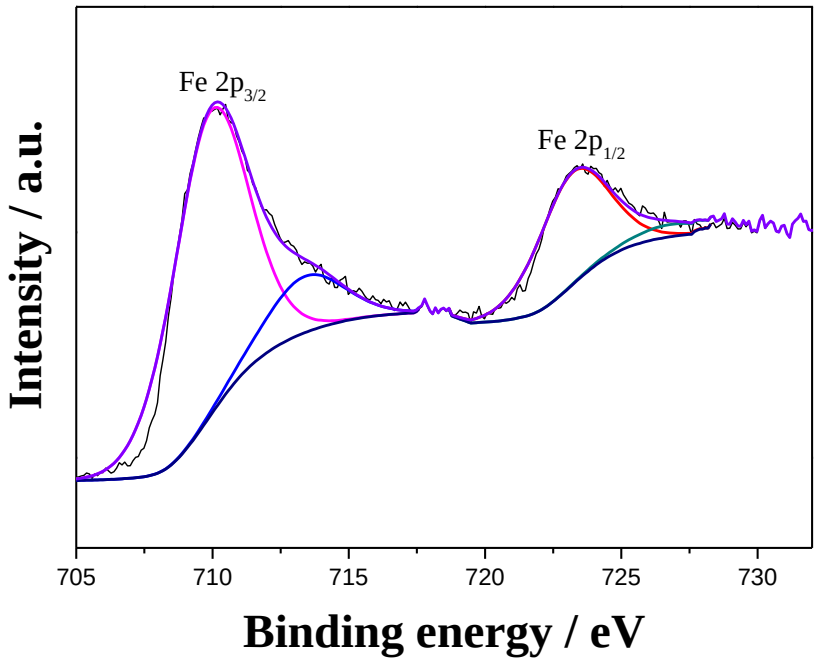


**Figure S3.** XPS core level spectrum of Fe 2p of LFP.

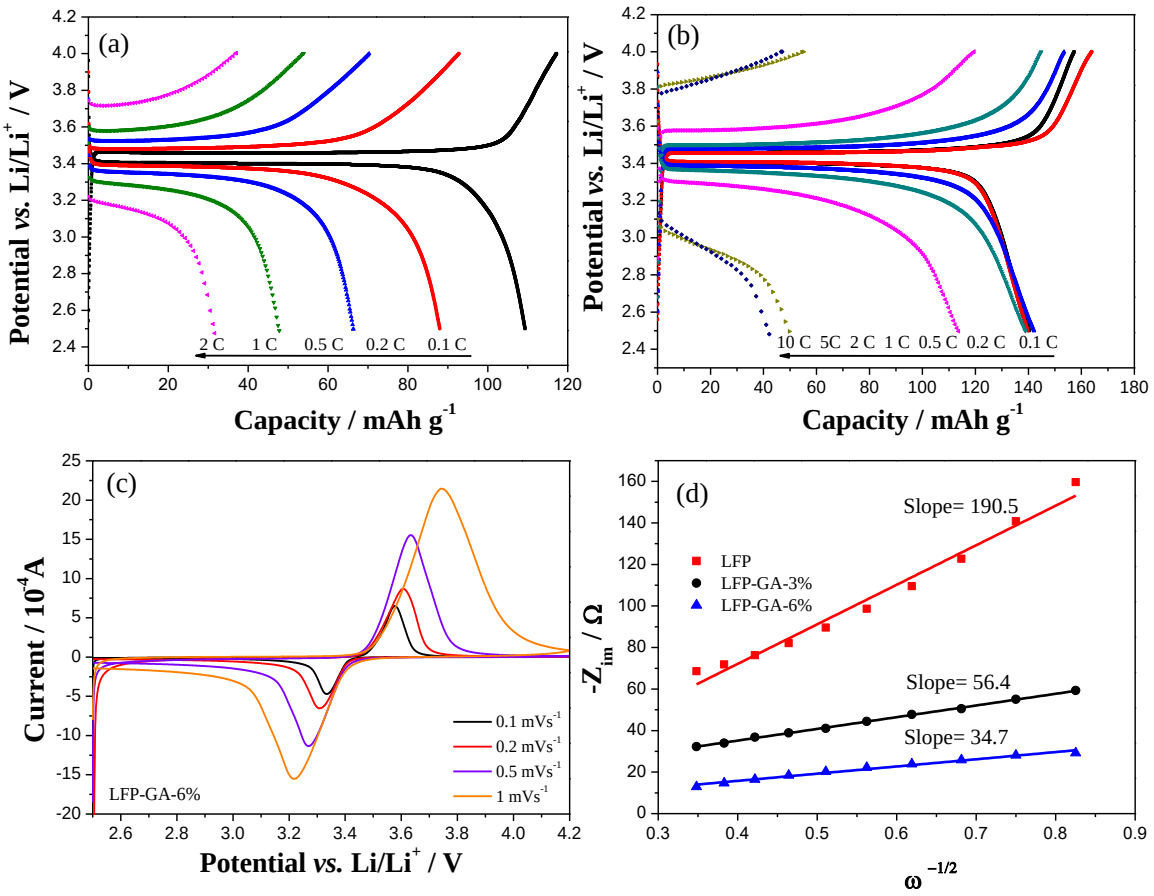


**Figure S4.** The discharge curves of (a) LFP and (b) LFP-GA-3% at different discharge rates, (c) CV curves of LFP-GA-6% at different scan rates, and (d) the fitting curves of $-Z_{im}$ and the reciprocal square root of the angular frequency at low frequency region of LFP, LFP-GA-3% and LFP-GA-6%.

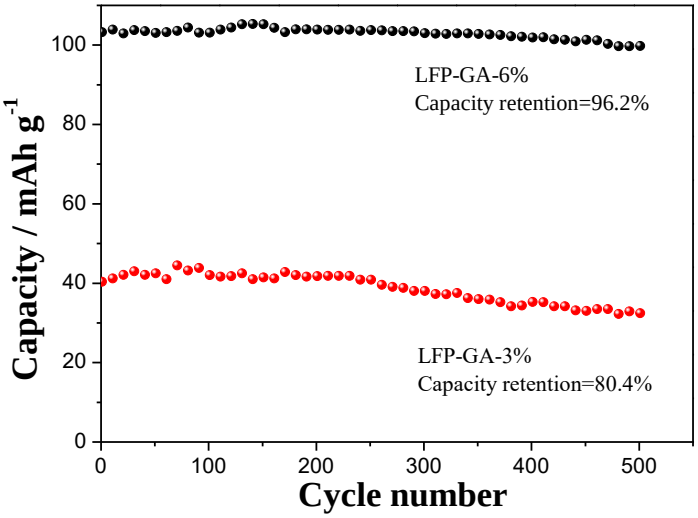


**Figure S5.** The cyclic performance of LFP-GA-3% and LFP-GA-6% during 500 cycles at 10 C.

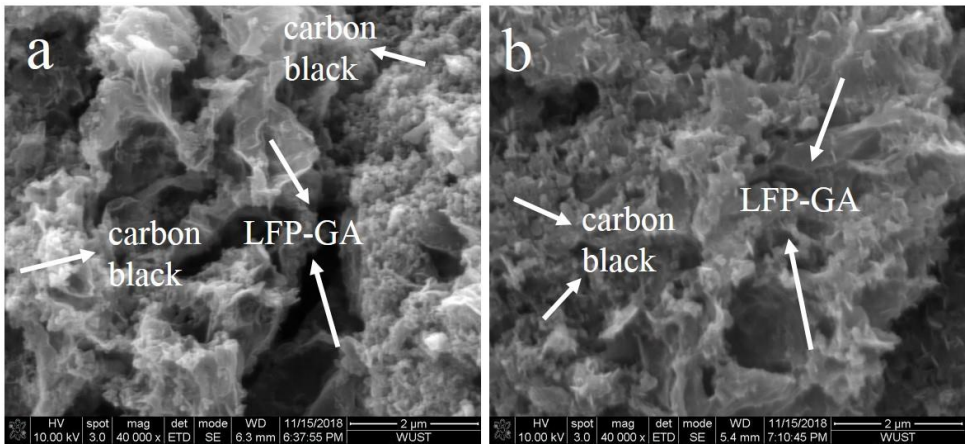


**Figure S6.** The SEM images of LFP-GA-6% electrode (a) before and (b) after cycling.

**Table S1.** Summary of the EIS fitted parameters, $Li^+$ diffusion coefficient and Warburg factor of the samples.

| Samples | Fitted parameters | | | |
|---|---|---|---|---|
| | **$R_s$ / (Ω)** | **$R_{ct}$ / (Ω)** | **σ / (Ω $s^{-1/2}$)** | **D / ($cm^2$ $s^{-1}$)** |
| LFP | 11 | 292 | 190.5 | $6.76\times10^{-15}$ |
| LFP-GA-3% | 8.6 | 245.1 | 56.4 | $6.55\times10^{-14}$ |
| LFP-GA-6% | 7.5 | 87.5 | 34.7 | $2.04\times10^{-13}$ |