Electronic Supplementary Information (ESI)

Facile and economical synthesis for “Plum Pudding” shaped porous $LiFePO_4$ /carbon composites for lithium ion batteries

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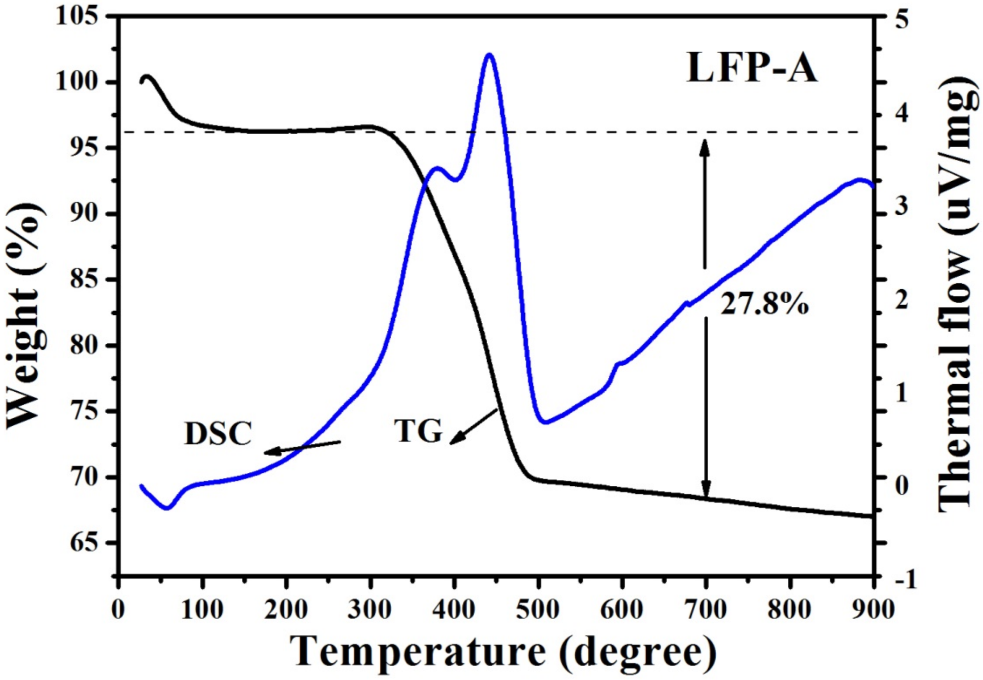

Fig.S1. TG/DSC patterns of TFP-A heated in oxygen from ambient to 900℃.

Calculation of carbon content: The TFP-A composite was sintered under flowing oxygen to completely remove the carbon component in a temperature range from room temperature to 900 ℃. As a result, during TG measurement in oxygen, by taking into account the total mass loss of 27.8 % at 700 ℃ on the TG curve shown in Fig.S1 and theoretical weight gain (5.07%) of pure $LiFePO_4$, the carbon content in the $LiFePO_4/C$ composite was calculated to be 31.2 % ($C_{WT}\% = 1 - \frac{1 - 27.8\%}{1 + 5.07\%} = 31.2\%$).

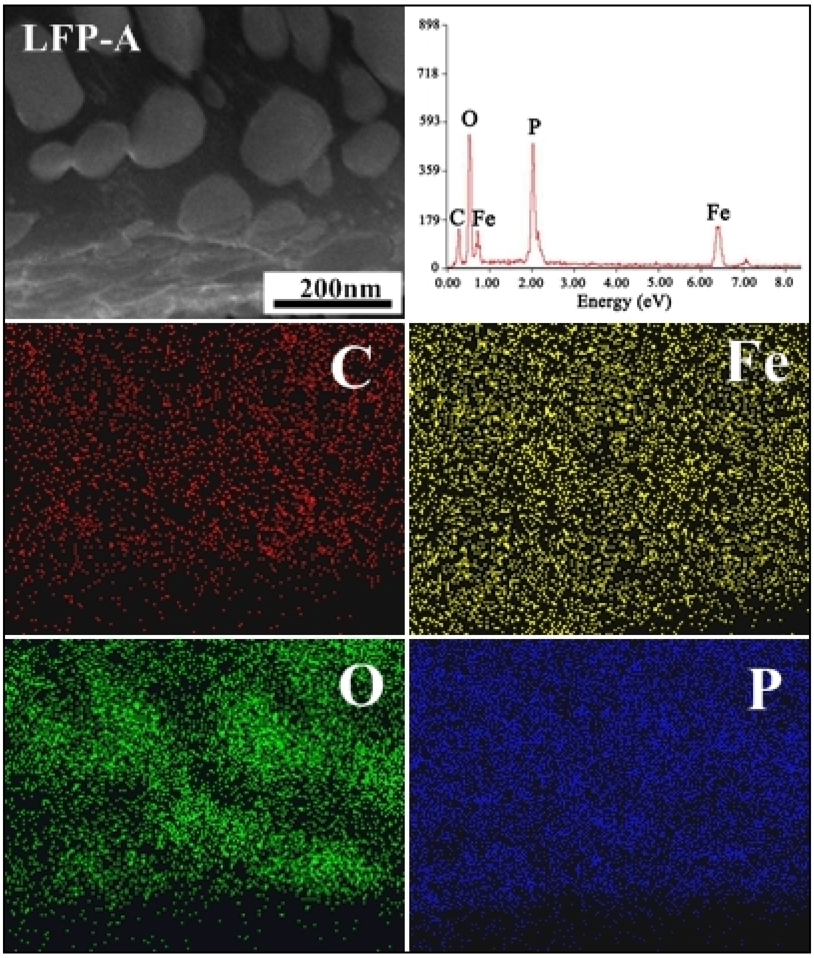

Fig.S2. SEM image of the LFP-A, EDS image and the corresponding elemental mappings of C, Fe, P and O.

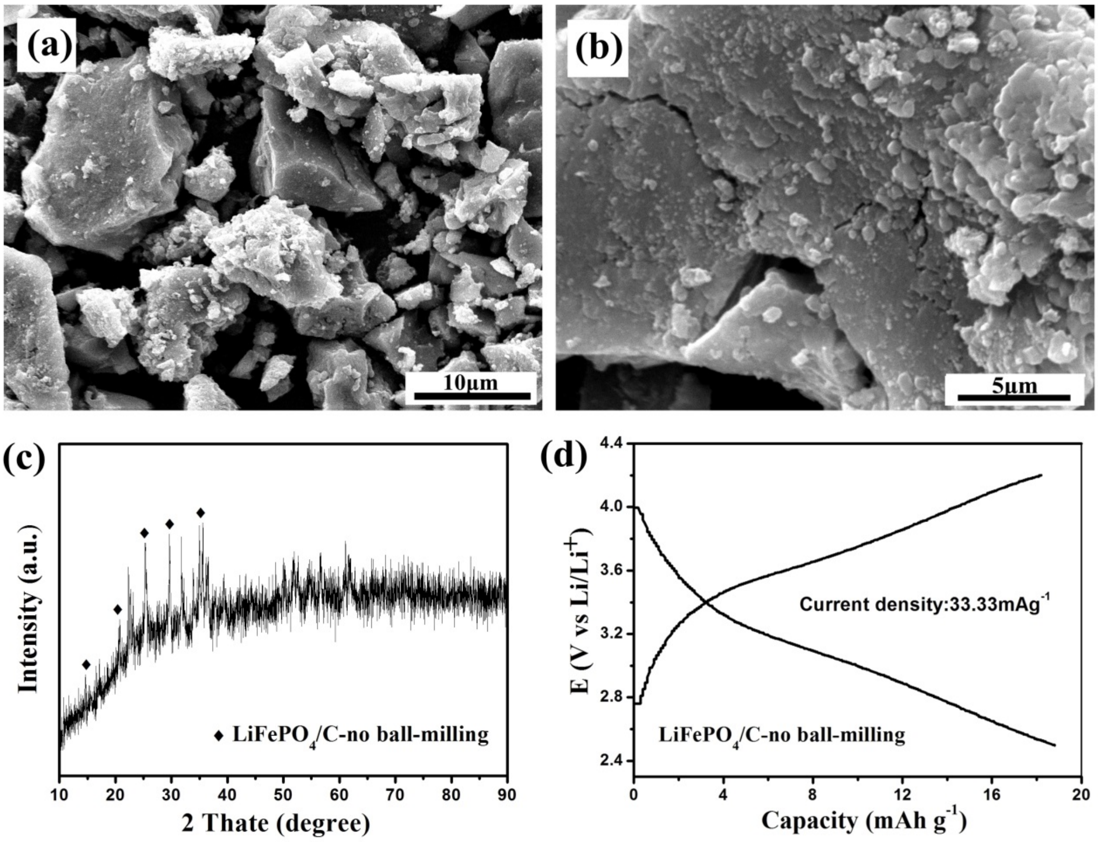

Fig.S3. (a, b) SEM and TEM images, (c) XRD-patterns and (d) first charge/discharge curves at 0.1 C of LiFePO$_4$/C composite with no ball-milling.

In order to evaluate the important role of ball milling, we try to prepare the sample by hand grinding in the mortar without ball-milling, which was denoted as LFP-NBM. In addition, XRD、SEM and galvanostatic charge/discharge were provided to analyze the structure and electrochemical performance of LFP-NBM. As shown in SEM images in Fig. S3 (a) and (b), the LFP-NBM exhibits a larger particle size distribution and a serious agglomeration of LiFePO$_4$ particles. Moreover, the XRD pattern of LFP-NBM shown in Fig. S3 (c) shows many diffraction peaks of impurity phases except LiFePO$_4$, and crystallinity is also very low. As a result, the first charge-discharge profiles of LFP-NBM at 0.1 C rate is shown in Fig. S3 (d), the LFP-A has a poor discharge capacity of 19.3 mAh g^{-1}.Therefore, oversimplified hand grinding of all precursors without ball-milling is adverse to improve performance of $LiFePO_4$. Thus, we have revised this part electronic supplementary information.