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Supplementary Information:

High performance porous $LiMnPO_4$ nanoflake: synthesis from a novel nanosheet precursor

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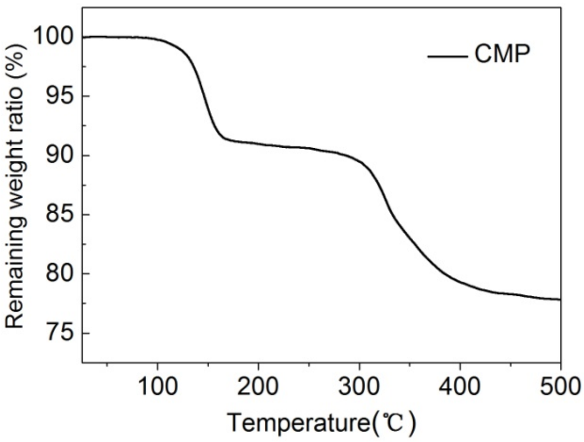

Fig. S1 Thermogravimetric (TG) curve of $(C_2N_2H_{10})Mn_2(PO_4)_2{\cdot}2H_2O$ nanosheets

The thermal decomposition process of $(C_2N_2H_{10})Mn_2(PO_4)_2{\cdot}2H_2O$ (CMP) in N_2 was measured from room temperature to 500℃. Apparently as shown in Fig. S1, there are two weight loss steps in TG curve. The first step between 100℃ and 170℃was attributed to the dehydration of CMP. The weight loss is 9.56%, close to the calculative value (9.05%). The second step between 240℃ and 500℃ corresponds to the elimination of ethylene-diamine. The weight loss is 12.52% which agrees well with calculative value 12.8% [1].

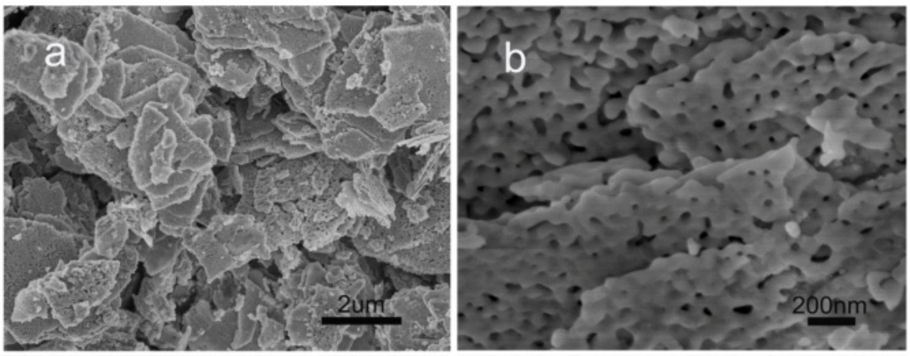

Fig. S2 Supplementary SEM images of $LiMnPO_4$: (a) low resolution, and (b) high resolution.

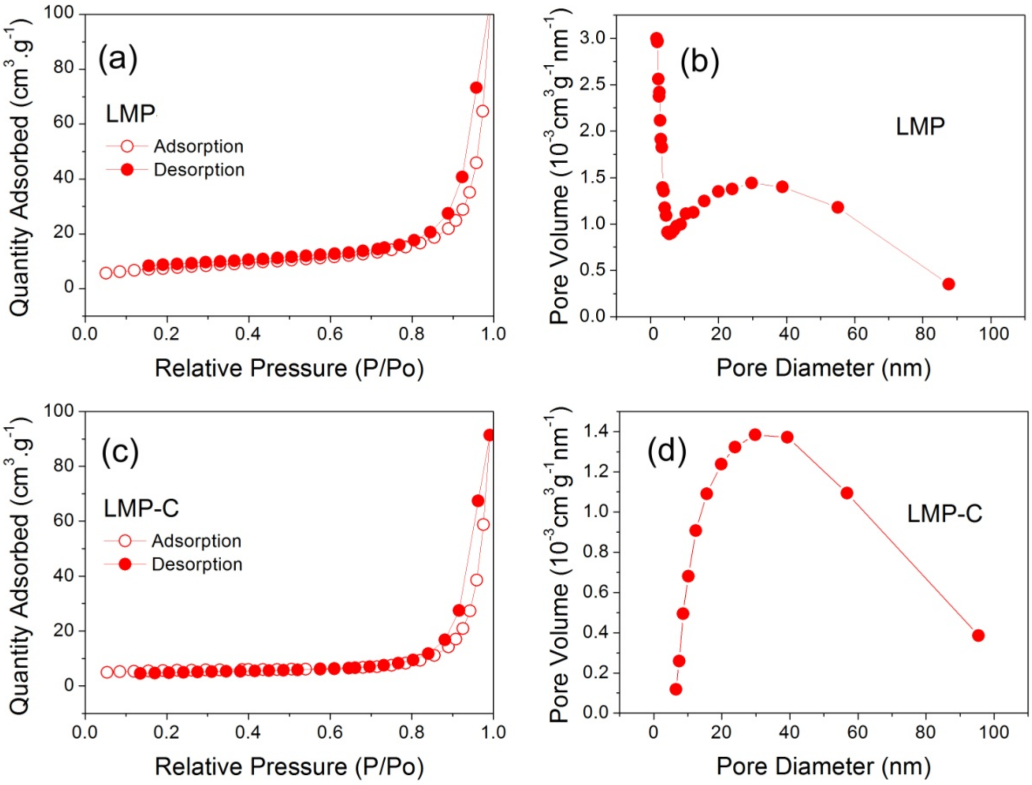

Fig. S3 Nitrogen adsorption and desorption isotherm (a, c) and BJH adsorption pore size distribution (b, d) of porous nanoflake structured $LiMnPO_4$ (LMP) and $LiMnPO_4$-C (LMP-C), respectively.

Fig.S3 shows the nitrogen adsorption-desorption isotherms (a, c) and the corresponding Barret-Joyner-Halenda (BJH) pore size distribution curves (b, d) of porous nanoflake structured $LiMnPO_4$ and $LiMnPO_4$-C, respectively. The measured BET surface areas of them are 26.2 $m^2 \cdot g^{-1}$, and 17.6 $m^2 \cdot g^{-1}$, respectively. Numerous micropores disappeared after carbon coating, which causes surface area reduced that can be indicated from the difference of pore size distribution between two samples. The average pore diameters of them are all close to 30nm.

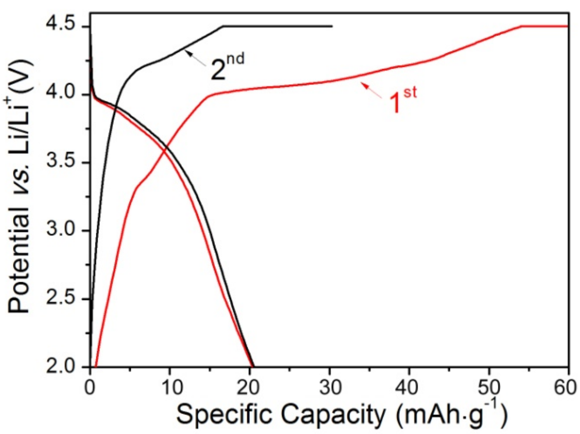

Fig. S4 Charge-discharge curves of pure $LiMnPO_4$ at 0.1C.

The initial twice charge-discharge (0.1C) curves of pure LiMnPO4 are shown in Fig. S4, conformably, which all parameters of the measurement process were adopted same with LiMPO4-C carried out. The discharge capacity is only ~20 $mAh \cdot g^{-1}$ since pure LiMnPO4 is an insulator and has much inferior electrochemical activity.

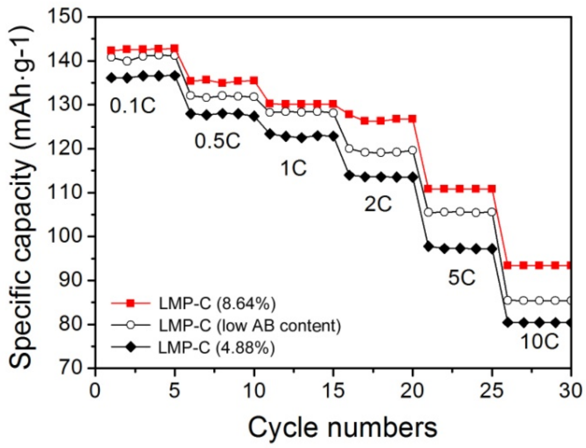

Fig. S5 Rate capabilities comparison of sample LMP-C (8.64%), LMP-C (low AB content) and LMP-C (4.88%). LMP-C (8.64%) and LMP-C (low AB content) have same coating carbon content 8.64 *wt.* %, but different electrodes formulation. That of LMP-C (8.64%) is active material (75 *wt.* %), conductive additive (15 *wt.* %), and binder (10 *wt.* %). That of LMP-C (low AB content) is active material (80 *wt.* %), conductive additive (10 *wt.* %), and binder (10 *wt.* %). LMP-C (4.88%) is the sample that has 4.88 *wt.* % of coating carbon content, and has same electrode formulation with LMP-C (8.64%).

The LiMnPO4-C with 4.88 *wt.* % coating carbon content was obtained by blending porous LiMnPO4 with glucose in a weight ratio of 10: 2 and heating at the same procedure with LiMnPO4-C (8.64 *wt.* % carbon content). As can be seen from Fig. S5, reduction of coating carbon content or conductive additive content both lower the capacities at some extent, however, the capacities were delivered by these two samples could also compare favorably with the high performance $LiMnPO_4$-C been reported in the literature.[2,3]

References

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