

Supporting Information

Atomic Scale Insight on the Fundamental Mechanism of Mn Doped LiFePO₄

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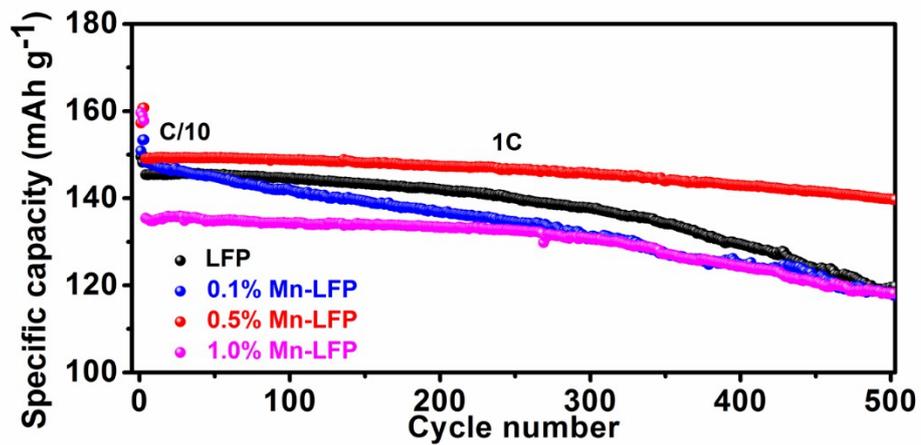


Figure S1 Cycling stabilities of LiFePO_4 (LFP) and Mn doped LiFePO_4 (Mn-LFP) with different Mn doping amount of 0.1%, 0.5% and 1.0% (weight percentage) cycled at 1C after 3 formations at C/10.

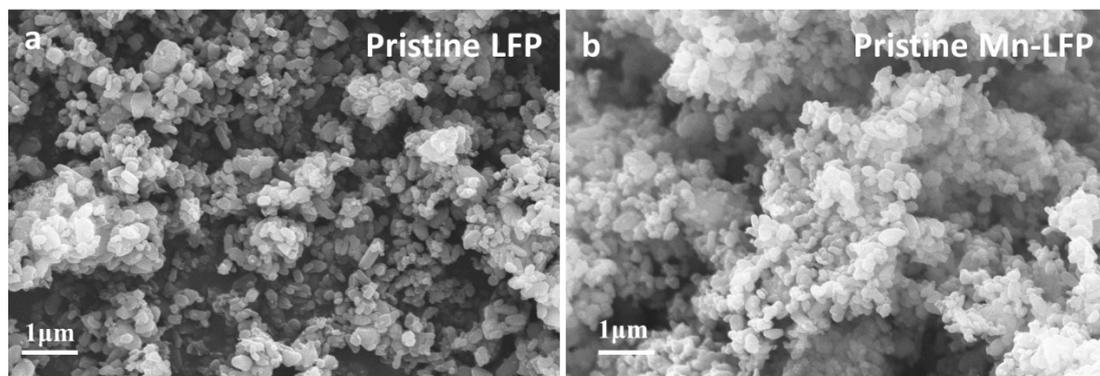


Figure S2 SEM images of the pristine LFP (a) and pristine Mn-LFP (b).

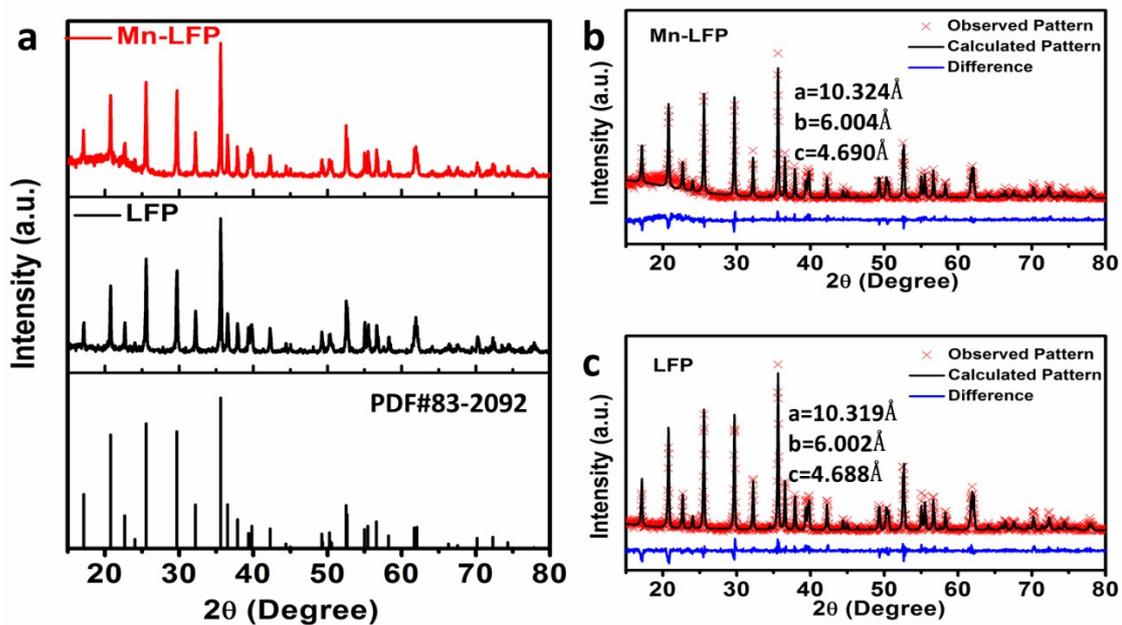


Figure S3 XRD patterns of the pristine LFP and the pristine Mn-LFP.

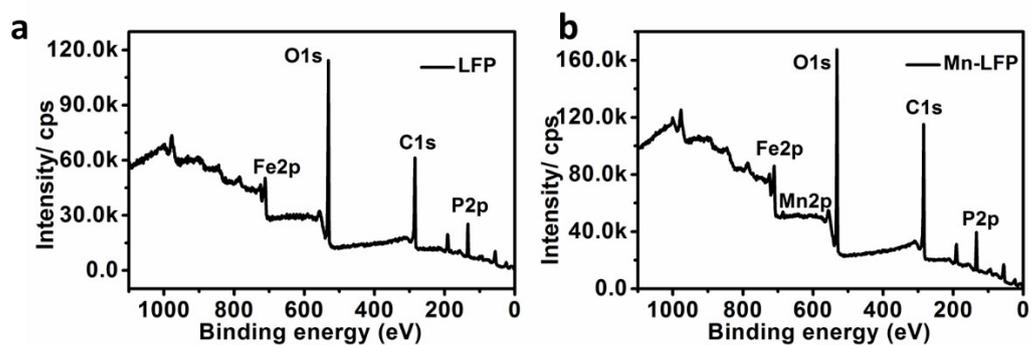


Figure S4 XPS survey spectra of the pristine LFP (a) and pristine Mn-LFP (b) powder samples.

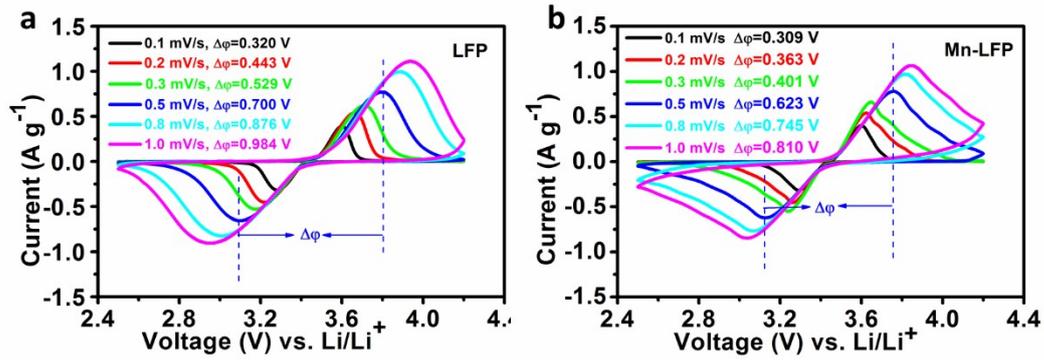


Figure S5(a) - (b) Cyclic voltammety (CV) curves of the LFP and Mn-LFP, between 2.5 - 4.2 V, with scan rates of 0.1, 0.2, 0.5, 0.8 and 1 mV s⁻¹.

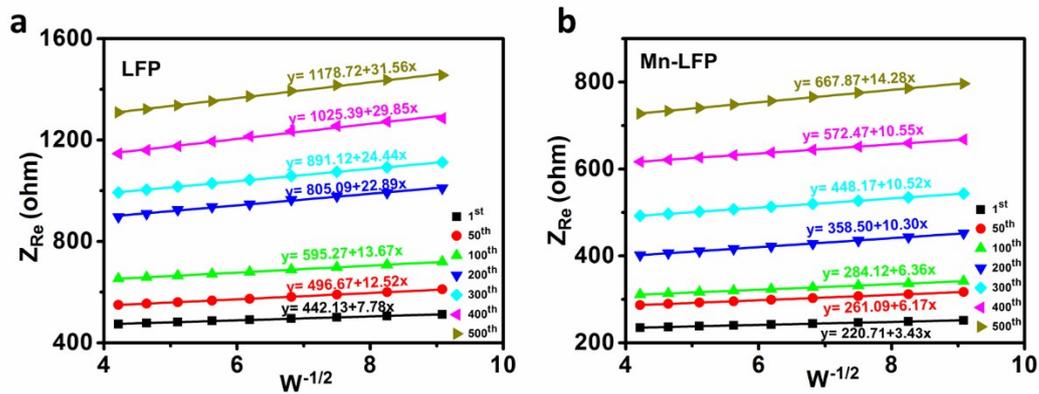


Figure S6(a) – (b) Relationship between the Z_{re} and the frequency of the pristine LFP versus Mn-LFP at the 1st, 50th, 100th, 200th, 400th, and 500th cycle. The slope, which is the Warburg impedance coefficient, was used to calculate the lithium-ion diffusion coefficient.

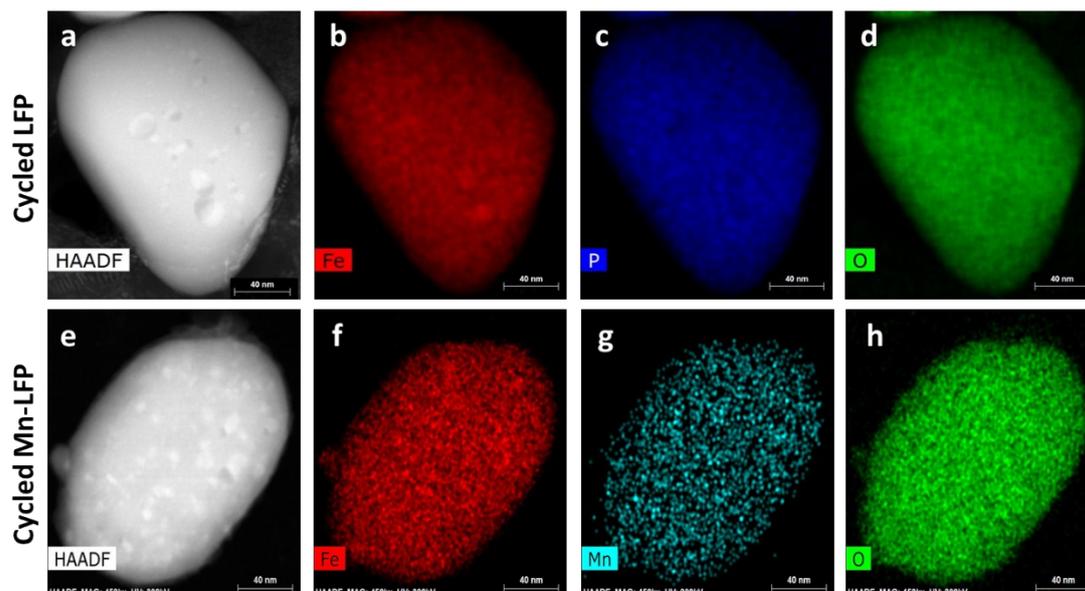


Figure S7(a) HAADF-STEM image of cycled LFP, (b) - (d) and the corresponding EDS mapping of Fe, P and O. (e) - (h) Analogous HAADF-STEM image and the corresponding EDS mapping of Fe, P and O but for cycled Mn-LFP.

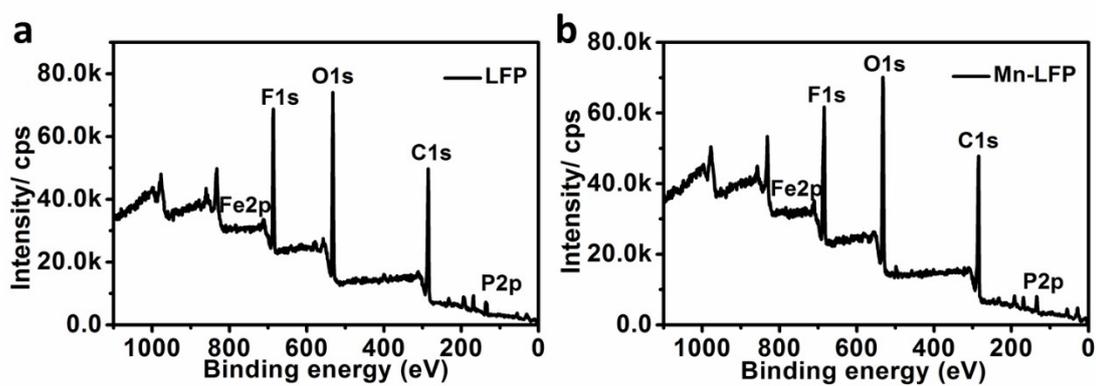


Figure S8 XPS survey spectra of the cycled LFP (a) and cycled Mn-LFP (b) cathodes.

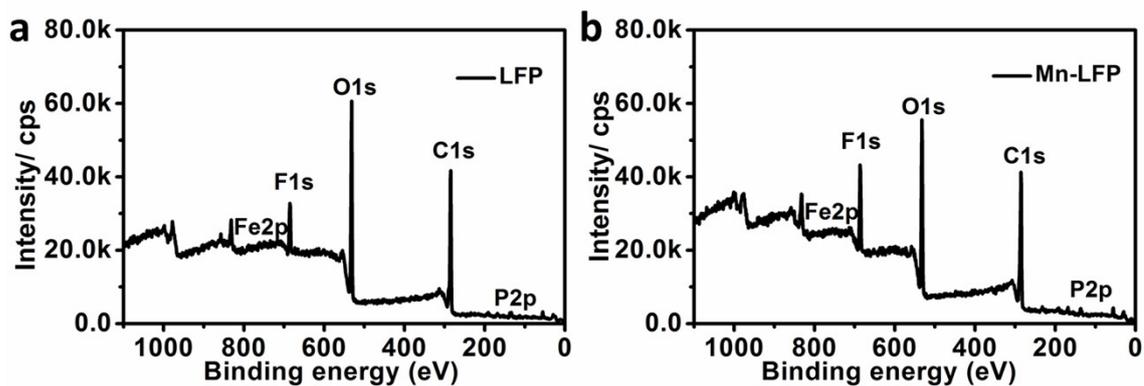


Figure S9 XPS survey spectra of the SEI formed on the post 500 cycled Li metal anodes, tested against LFP **(a)**, and tested against Mn-LFP **(b)**.

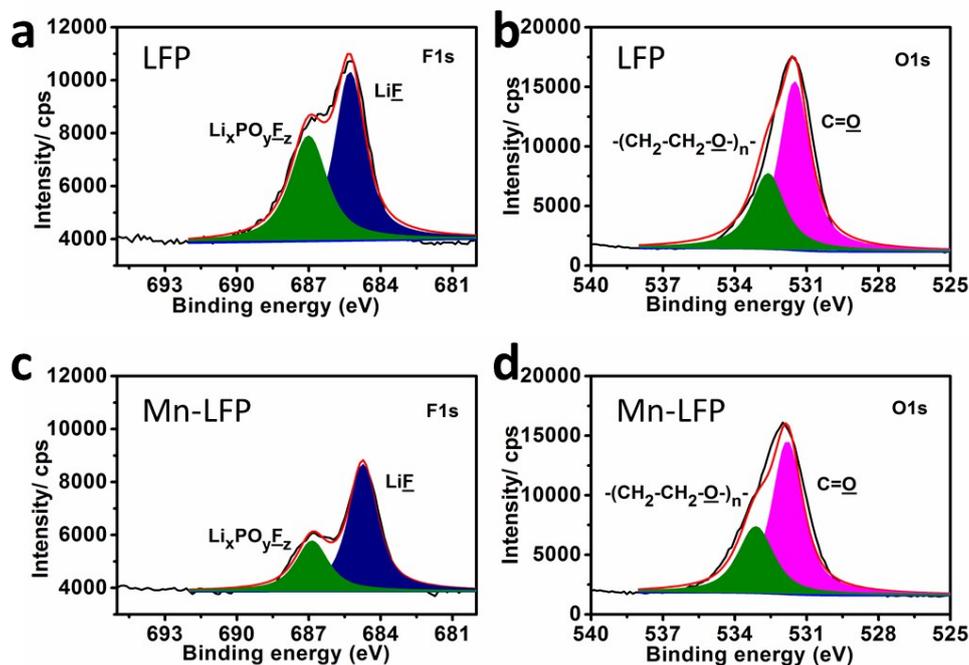


Figure S10(a) - (b) XPS high resolution spectra of F 1s and O 1s in the SEI formed on the post 500 cycled Li metal anode tested against LFP. **(c) - (d)** The corresponding XPS high resolution spectra tested against Mn-LFP.

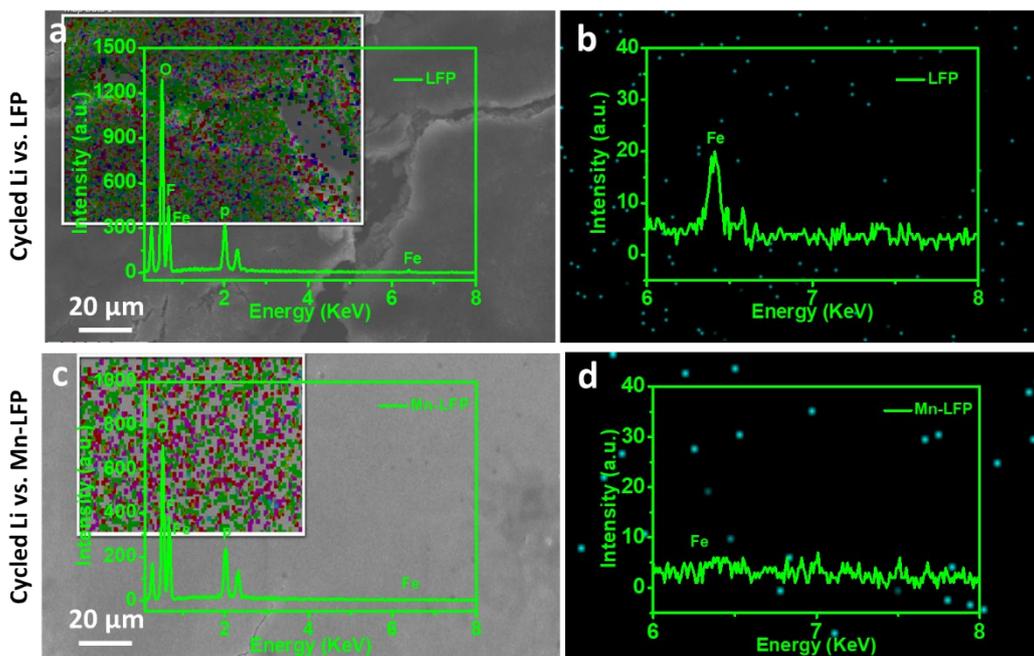


Figure S11 (a) - (b) SEM image and EDS elemental mapping of O, F, P and Fe for the SEI formed on the post 500 cycled Li metal anode tested against LFP. **(c) - (d)** The corresponding SEM image and EDS elemental mapping of O, F, P and Fe for the SEI tested against Mn-LFP.