

## Supplementary information : Insertion of fluorine in $\text{LiFePO}_4$ electrode material by gas-solid fluorination

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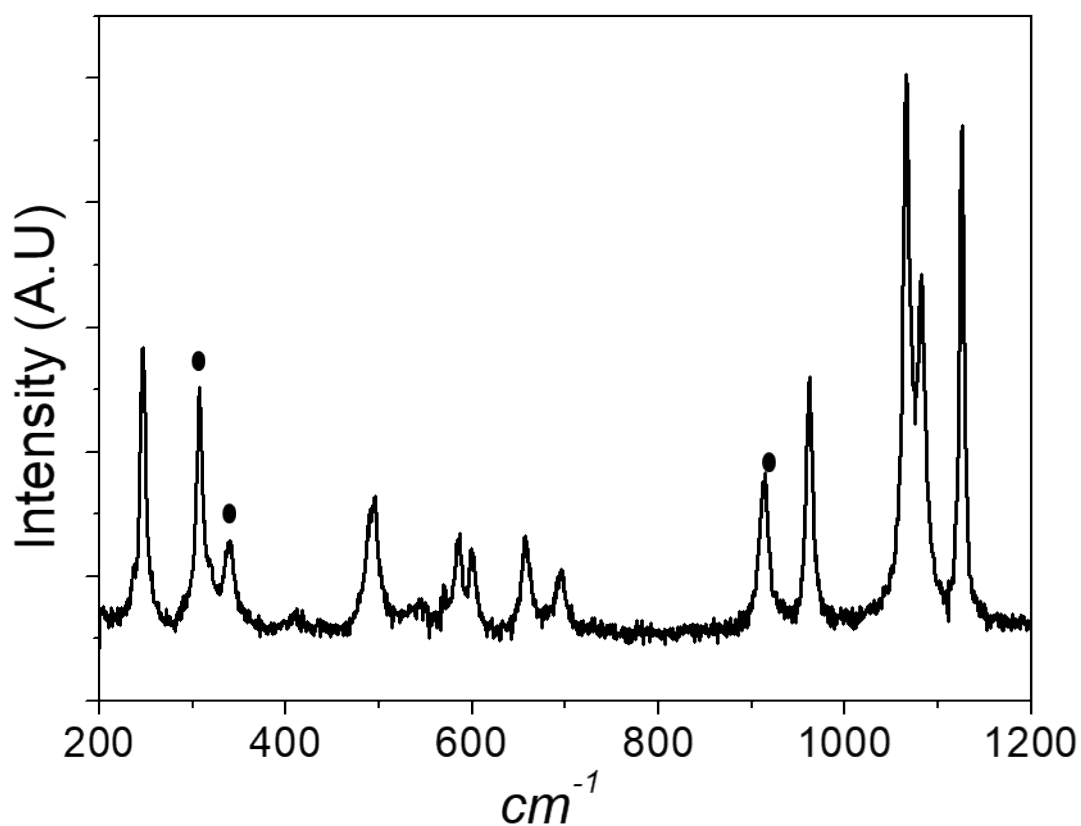


Figure S1 : Raman spectra of  $\text{LiFePO}_4$  fluorinated at  $125^\circ\text{C}$ , black dots corresponding to  $\text{FePO}_4$ .

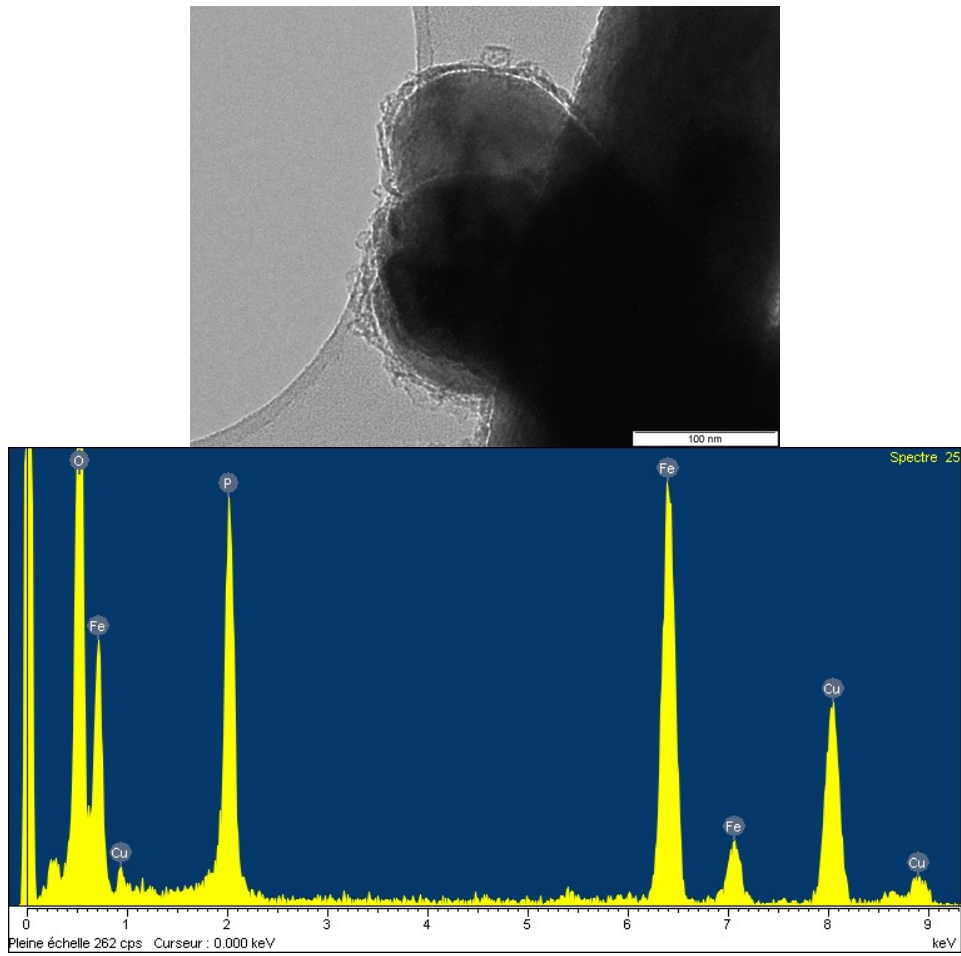


Figure S2 : Transmission electronic microscopy image (TEM) and chemical analysis by Energy Dispersive Spectrometry (TEM-EDS) of  $\text{LiFePO}_4 + \text{F}_2$  125°C particles core.

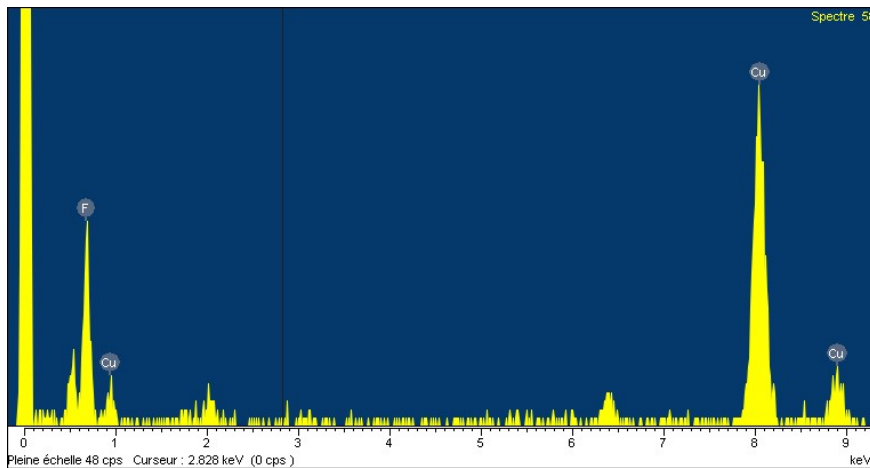
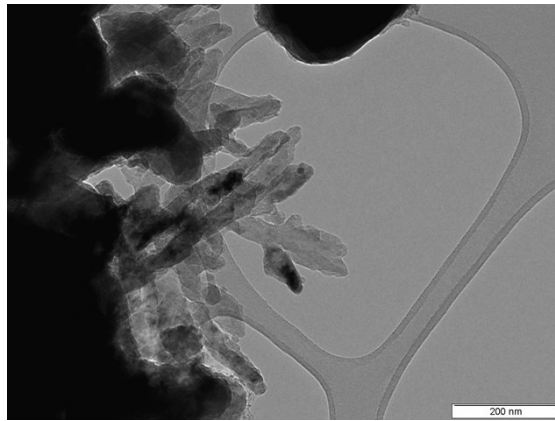


Figure S3 : Transmission electronic microscopy image (TEM) and chemical analysis by Energy Dispersive Spectrometry (TEM-EDS) of  $\text{LiFePO}_4 + \text{F}_2$  125°C particles shell.

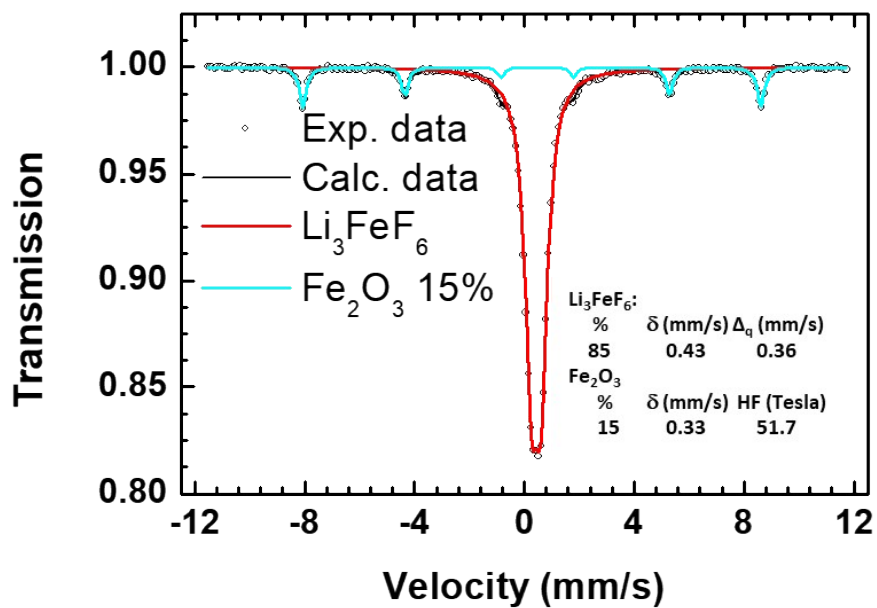


Figure S4 :  $^{57}\text{Fe}$  Mössbauer spectra at 300 K of  $\alpha\text{-Li}_3\text{FeF}_6$  obtained with  $\text{Li}_2\text{CO}_3 + \text{FePO}_4 \cdot 4\text{H}_2\text{O}$  in  $\text{Hf}_{\text{aq}}$  48% with a second treatment under  $\text{F}_2$  at 250°C.  $\text{Fe}_2\text{O}_3$  is obtained as an impurity at 15 %Fe at.

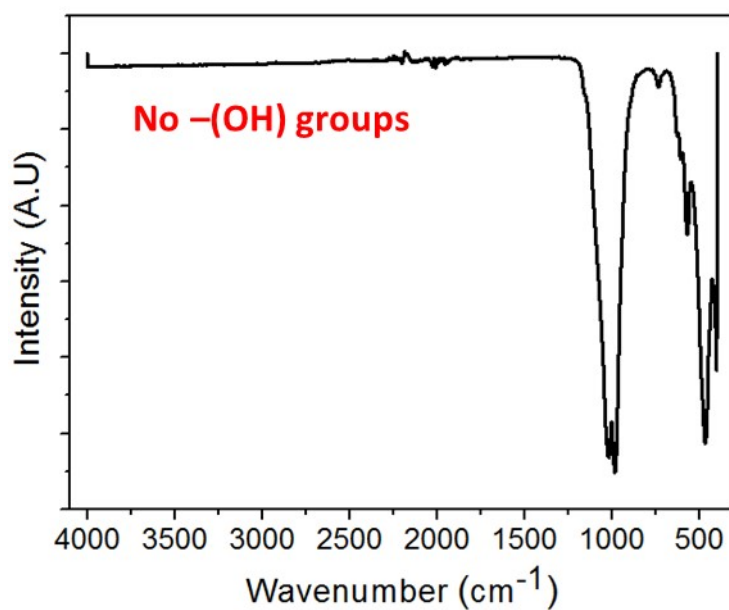


Figure S5 : IR spectra of LiFePO<sub>4</sub> + F<sub>2</sub> 125°C – N<sub>2</sub>.

Table S1: Synthesis conditions for the obtention of the different fluorinated materials

<b>Coumpound</b>	<b>Treatment</b>	<b>Label</b>	
<b>LiFePO<sub>4</sub></b>	-	LiFePO <sub>4</sub>	<b>Pristine</b>
	F <sub>2</sub> at RT	LiFePO <sub>4</sub> + F <sub>2</sub> - RT	<b>Low Temperature</b>
	F <sub>2</sub> at 125°C	LiFePO <sub>4</sub> + F <sub>2</sub> - 125	
	F <sub>2</sub> at 250°C	LiFePO <sub>4</sub> + F <sub>2</sub> - 250	
	F <sub>2</sub> at 350°C	LiFePO <sub>4</sub> + F <sub>2</sub> - 350	
	F <sub>2</sub> at 500°C	LiFePO <sub>4</sub> + F <sub>2</sub> - 500	
<b>LiFePO<sub>4</sub> -RT</b>	annealing under N <sub>2</sub> (550°C ; 24h)	LiFePO <sub>4</sub> - RT + N <sub>2</sub>	<b>Annealed</b>
<b>LiFePO<sub>4</sub> -125</b>	annealing under N <sub>2</sub> (550°C ; 24h)	LiFePO <sub>4</sub> -125 + N <sub>2</sub>	<b>Annealed</b>