

# Supporting Information

## Enhanced performance of $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}$ in potassium batteries by carbon coating interface

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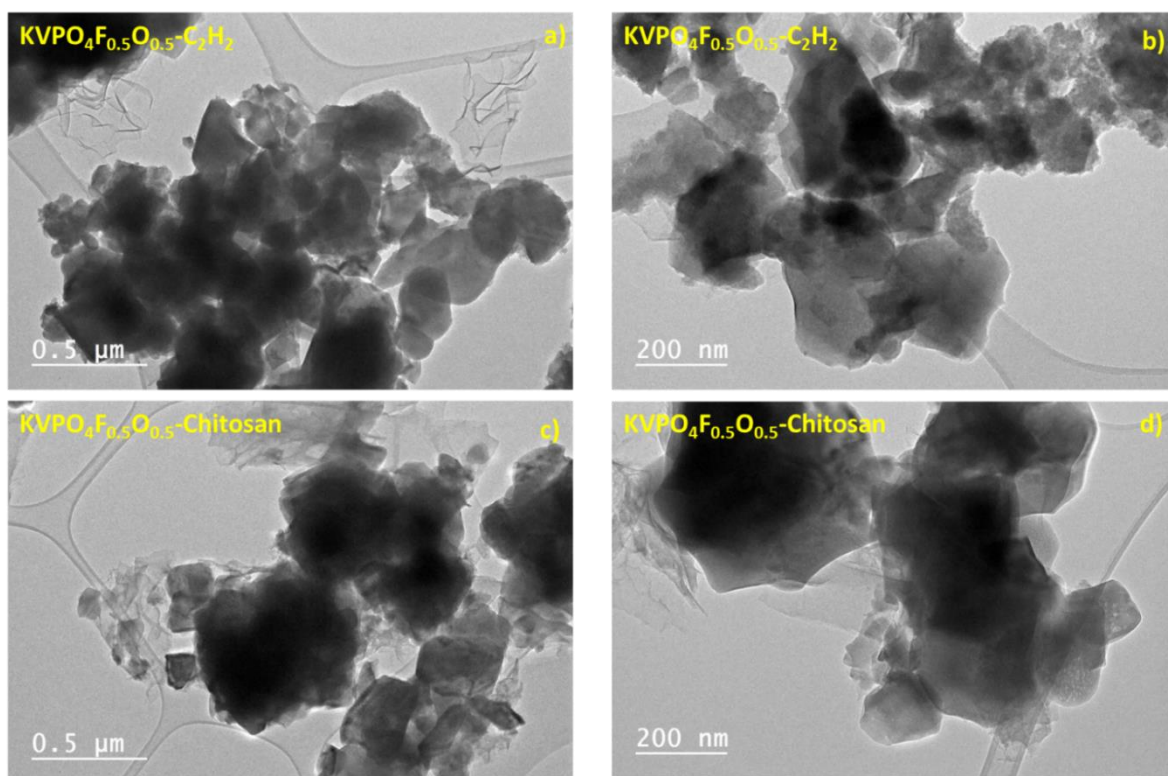
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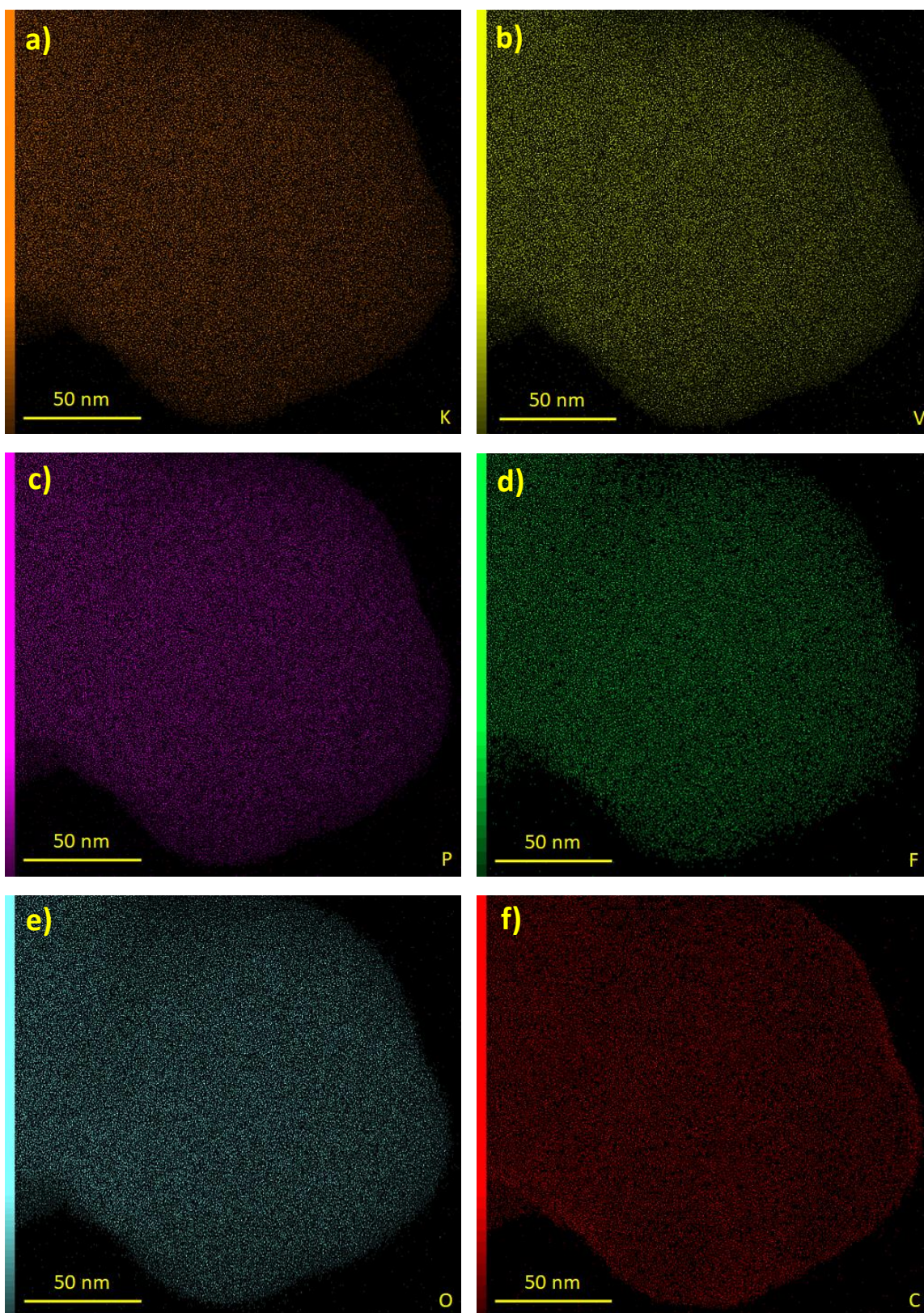
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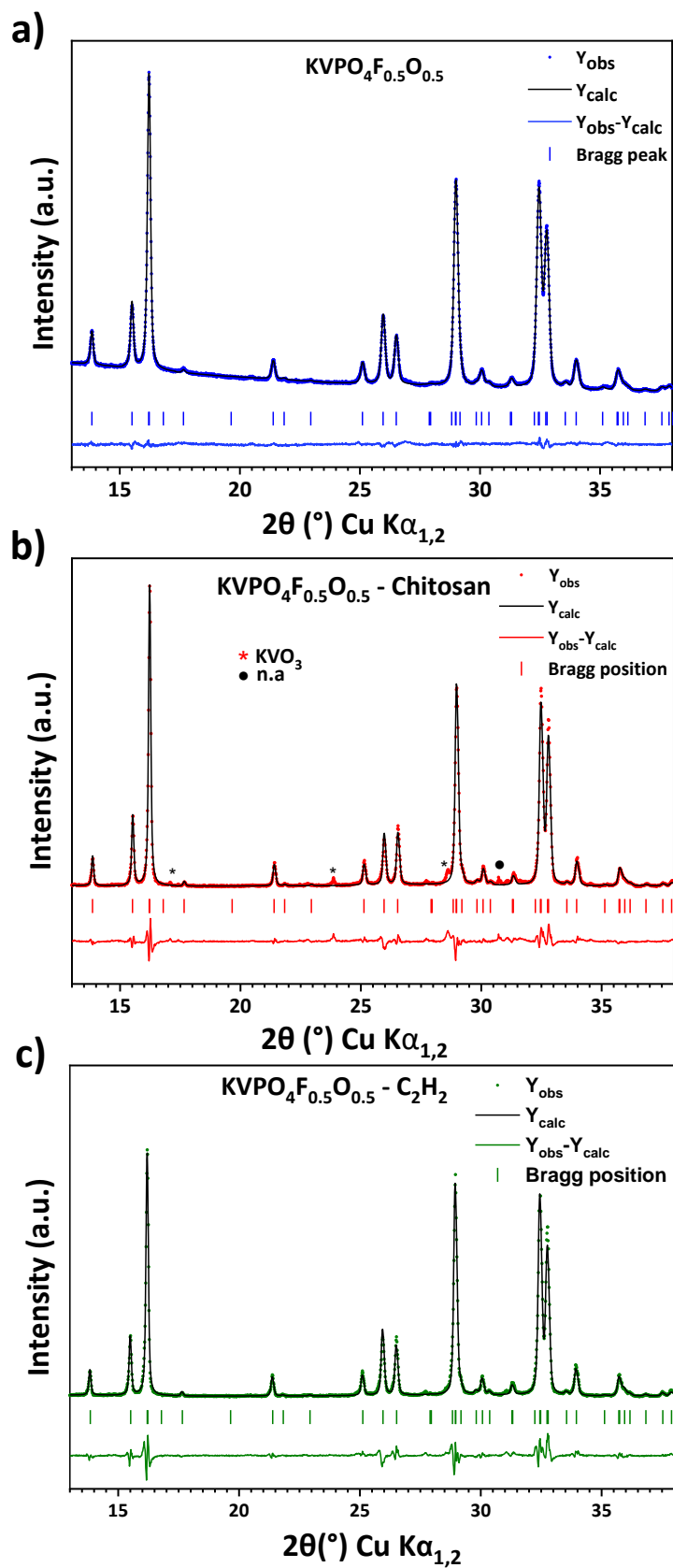


**Figure S1:** TEM images of: (a, b) KVPO<sub>4</sub>F<sub>0.5</sub>O<sub>0.5</sub>-C<sub>2</sub>H<sub>2</sub> and (c, d) KVPO<sub>4</sub>F<sub>0.5</sub>O<sub>0.5</sub>-Chitosan at different scales 0.5 μm and 200 nm, respectively.





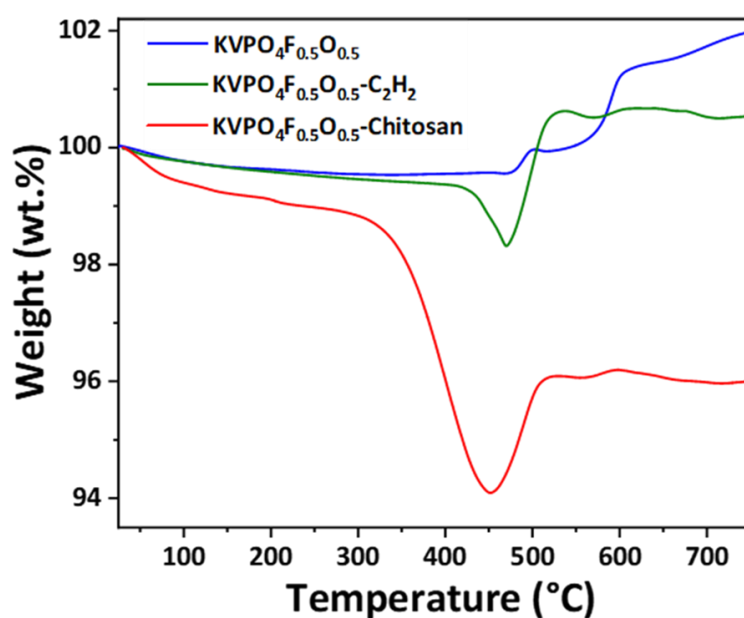
**Figure S2:** EDX images of elemental composition of  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}\text{-C}_2\text{H}_2$  material: (a) K, (b) V, (c) P, (d) F, (e) O and (f) C.



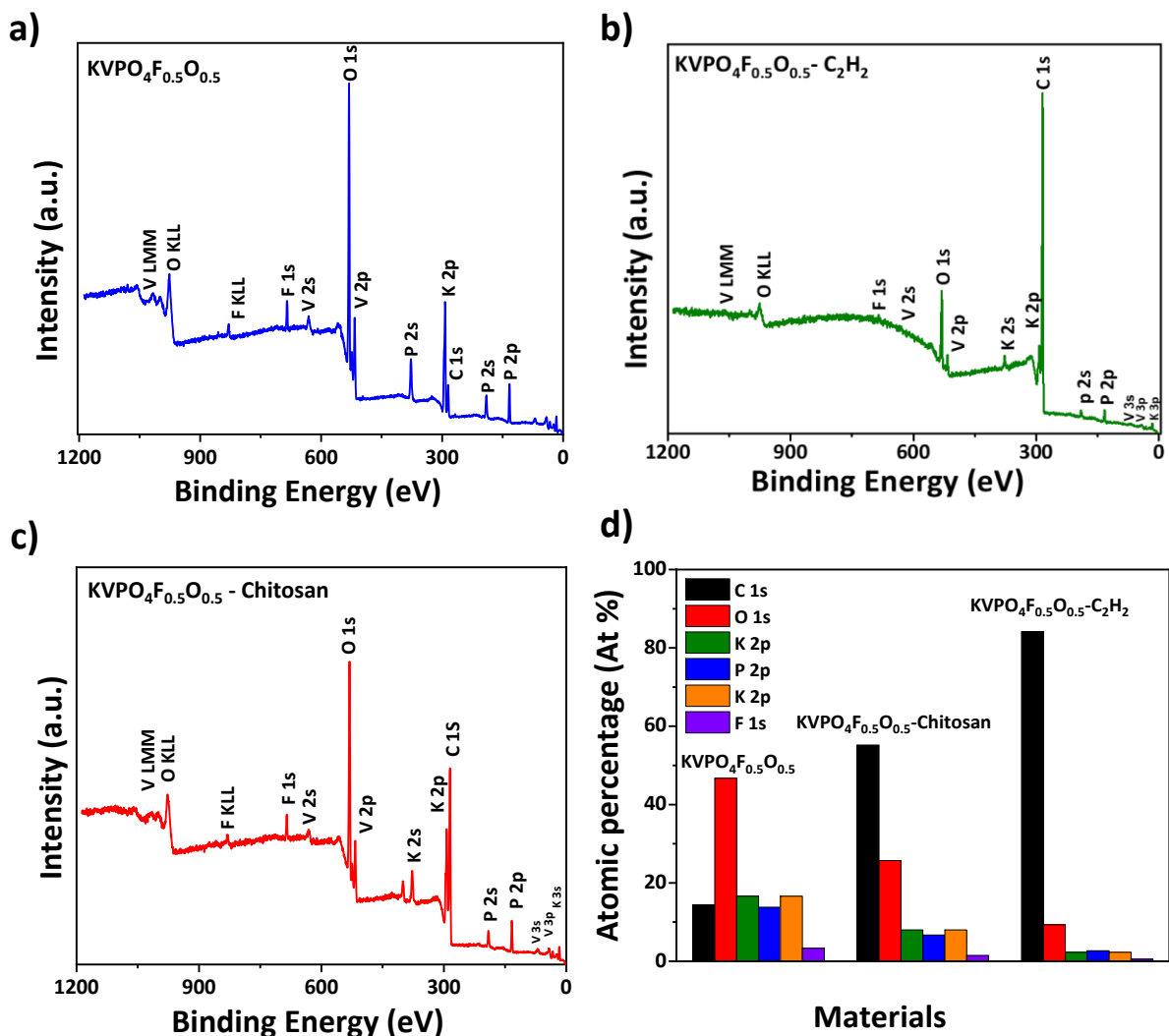
**Figure S3:** Rietveld refinements of the XRD patterns of: (a)  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}$ , (b)  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}$ -Chitosan and (c)  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}$ - $\text{C}_2\text{H}_2$ .

**Table S1:** Cell parameters and  $K^+$  site occupancy refined by the Rietveld method in unit cells described in the  $Pna2_1$  space group for  $KVPFO_4F_{0.5}O_{0.5}$ ,  $KVPFO_4F_{0.5}O_{0.5}$ -Chitosan and  $KVPFO_4F_{0.5}O_{0.5}$ - $C_2H_2$ .

Compound	a (Å)	b (Å)	c (Å)	V/Z (Å <sup>3</sup> )	$K^+$ site occupancy
$KVPFO_4F_{0.5}O_{0.5}$	12.7912(3)	6.3819(2)	10.5456(2)	107.60(2)	0.99(4)
$KVPFO_4F_{0.5}O_{0.5}$ -Chitosan	12.774(2)	6.378(2)	10.551(2)	107.45(3)	1.00 (4)
$KVPFO_4F_{0.5}O_{0.5}$ - $C_2H_2$	12.780(2)	6.3787(5)	10.552(2)	107.53(3)	0.95 (6)



**Figure S4:** TGA curves of  $KVPO_4F_{0.5}O_{0.5}$ ,  $KVPO_4F_{0.5}O_{0.5}-C_2H_2$  and  $KVPO_4F_{0.5}O_{0.5}$ -Chitosan obtained under air atmosphere at  $5\text{ }^\circ\text{C min}^{-1}$ .



**Figure S5:** XPS wide (survey) spectra of: (a)  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}$ , (b)  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}-\text{C}_2\text{H}_2$  and (c)  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}-\text{Chitosan}$ , (d) atomic percentages of elements at the surface, within the probed thickness, for  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}$ ,  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}-\text{Chitosan}$  and  $\text{KVPO}_4\text{F}_{0.5}\text{O}_{0.5}-\text{C}_2\text{H}_2$ .