

## Supporting Information

### **Vanadium-doped $\text{Li}_2\text{TiSiO}_5$ anode for boosting specific capacity and cycling stability of lithium-ion batteries**

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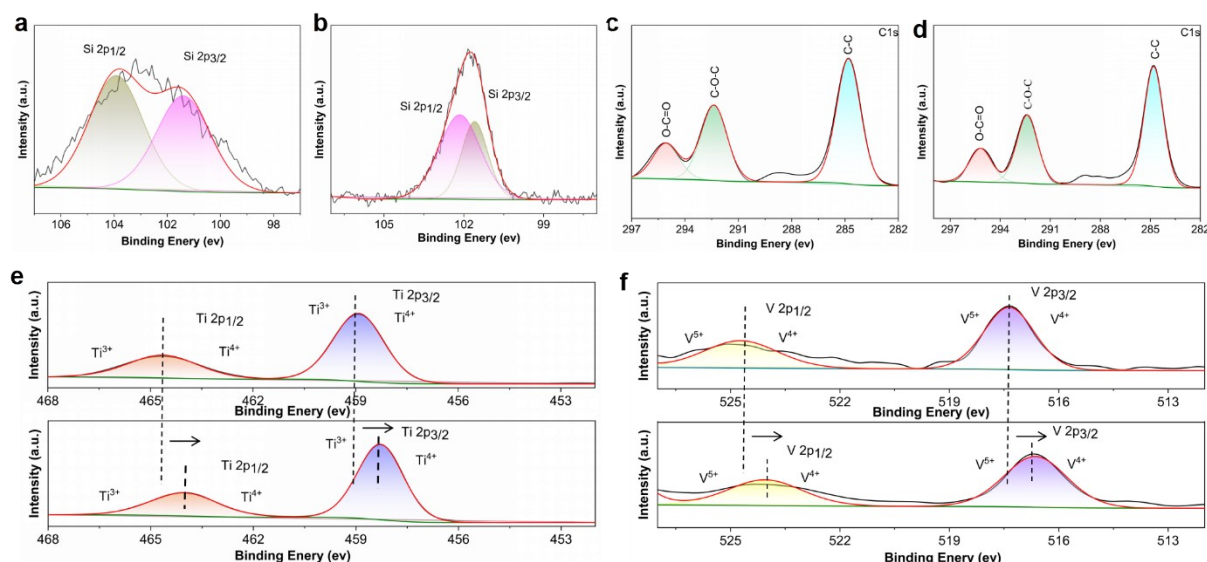
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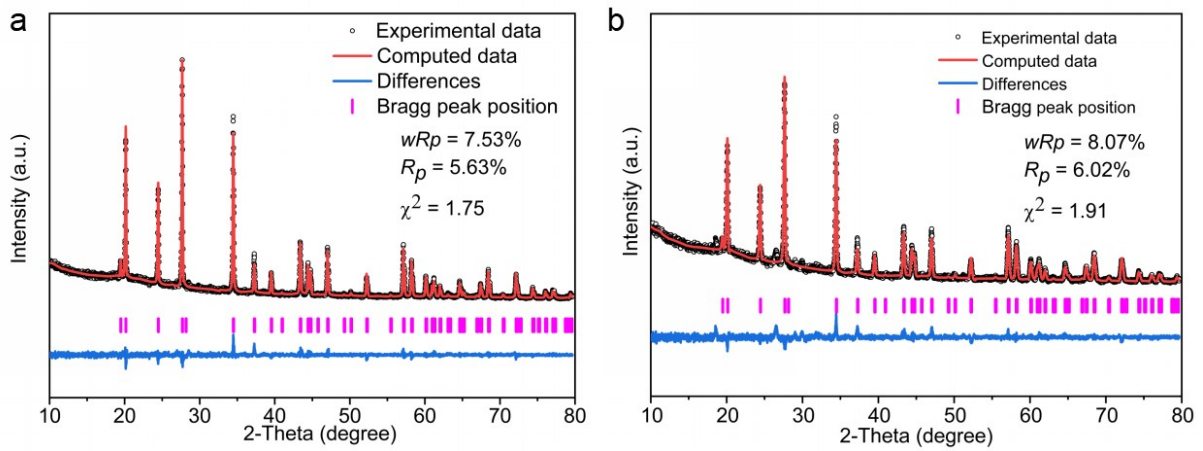


**Figure S1** a) High-resolution Si 2p of  $\text{Li}_2\text{TiSiO}_5$ . b) High-resolution Si 2p of  $\text{Li}_2\text{Ti}_{0.95}\text{V}_{0.05}\text{SiO}_5$ . c) High-resolution in-situ XPS of C1s in  $\text{Li}_2\text{Ti}_{0.95}\text{V}_{0.05}\text{SiO}_5$  in the dark. d) High-resolution in-situ XPS of C1s under  $\text{Li}_2\text{Ti}_{0.95}\text{V}_{0.05}\text{SiO}_5$  illumination. e) High-resolution Ti 2p of  $\text{Li}_2\text{Ti}_{0.95}\text{V}_{0.05}\text{SiO}_5$  high-resolution Ti 2p in situ XPS. f) High-resolution V 2p in situ XPS of  $\text{Li}_2\text{Ti}_{0.95}\text{V}_{0.05}\text{SiO}_5$ .

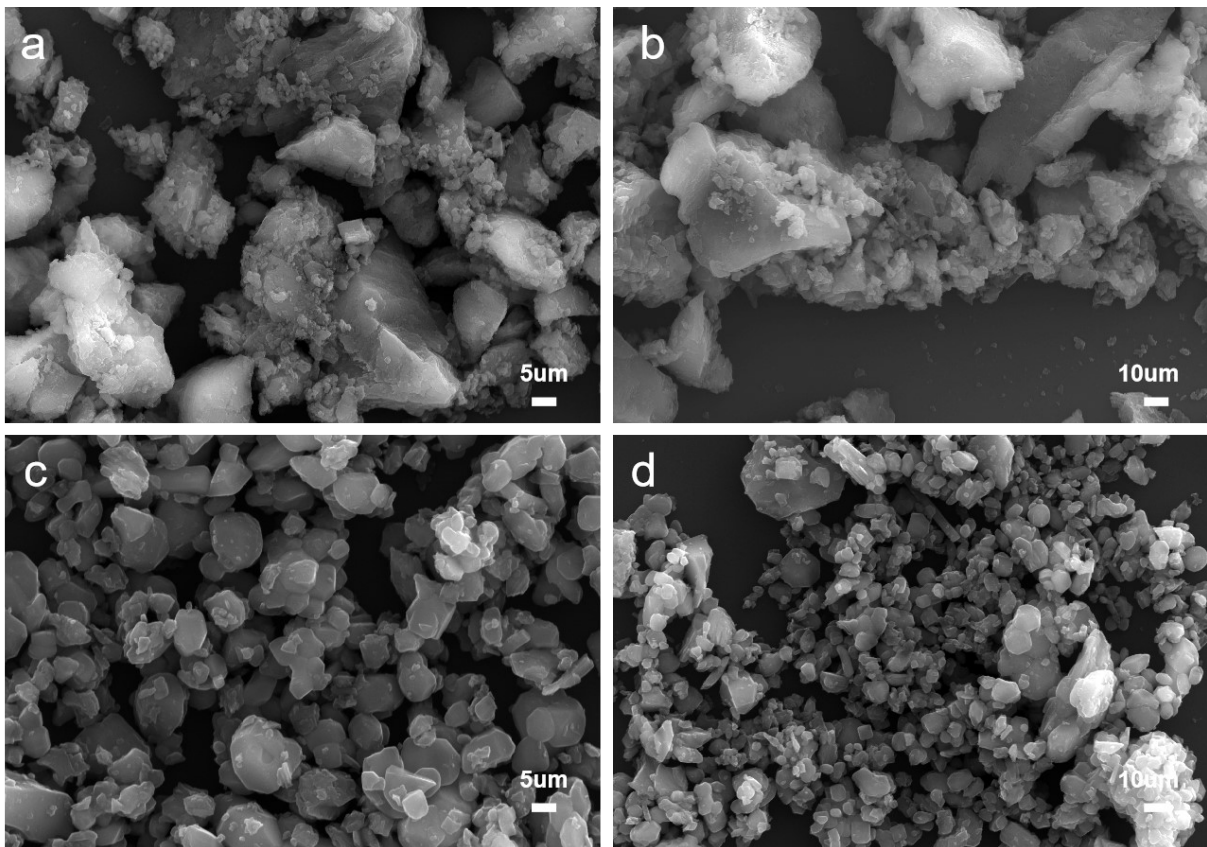
**Table S1** Refined lattice parameters of  $\text{Li}_2\text{Ti}_{1-x}\text{V}_x\text{SiO}_5$  ( $x = 0, 0.025, 0.05$  and  $0.075$ ) samples; along with R-factors

sample	Space group	$a$ (Å)	$b$ (Å)	$c$ (Å)	$V$ (Å) <sup>3</sup>	$R_p$	$wR_p$	$\chi^2$
$\text{Li}_2\text{Ti}_1\text{SiO}_5$	P 4/n m m	6.443540	6.443540	4.42120	183.1012	9.01%	6.89%	1.76
$\text{Li}_2\text{Ti}_{0.975}\text{V}_{0.025}\text{SiO}_5$	P 4/n m m	6.44510	6.44510	4.40530	182.9931	5.63%	7.53%	1.75
$\text{Li}_2\text{Ti}_{0.95}\text{V}_{0.05}\text{SiO}_5$	P 4/n m m	6.44340	6.44340	4.40579	182.9703	6.28%	8.44%	1.71
$\text{Li}_2\text{Ti}_{0.925}\text{V}_{0.075}\text{SiO}_5$	P 4/n m m	6.44680	6.44680	4.41020	183.2934	6.02%	8.07%	1.91

Note: All samples have the same cell angle. ( $\alpha = 90^\circ, \beta = 90^\circ, \gamma = 90^\circ$ )



**Figure S2** a) Refined graphs of  $\text{Li}_2\text{Ti}_{0.975}\text{V}_{0.025}\text{SiO}_5$ . b) Reined graphs of  $\text{Li}_2\text{Ti}_{0.925}\text{V}_{0.075}\text{SiO}_5$ .



**Figure S3** SEM images of (a and b) LTSO and (c and d)  $\text{Li}_2\text{Ti}_{0.95}\text{V}_{0.05}\text{SiO}_5$  at different magnifications.