Electronic Supplementary Information

**Cu Doped V\textsubscript{2}O\textsubscript{5} Flowers as Cathode Material for High-Performance Lithium Ion Batteries**

Hong Yu, Xianhong Rui, Huiteng Tan, Jing Chen, Xin Huang, Chen Xu, Weiling Liu, Denis Y. W. Yu, Harry E. Hoster, Qingyu Yan*

School of Materials Science and Engineering, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798, Singapore.

---

**Fig. S1** The XRD patterns of the as synthesized samples before anneal: VO-0, VO-1 and VO-2.
**Fig. S2** FESEM images of the VO–0 sample collected at different hydrothermal time: (a) 30min, (b) 60min, (c) 80min and (d) 100min.
Fig. S3 (a) The corresponding XPS spectra for the O 1s and V 2p bands, (b) XPS wide-scan survey of sample V$_2$O$_5$-0. (c) The corresponding XPS spectra for the O 1s and V 2p bands, Insert: XPS wide-scan survey of sample V$_2$O$_5$-1. (d) The corresponding XPS spectra for the Cu 2p bands of sample V$_2$O$_5$-1.
Fig. S4 Representative FESEM images of the post annealing samples (a) V2O5-0 and (d) V2O5-1. Representative TEM images of the post annealed samples (b) V2O5-0 and (e) V2O5-1. Representative HRTEM images and its selected area electron diffraction (SAED) pattern (insert) of post annealed samples (c) V2O5-0 and (f) V2O5-1 with zone axis [001].
Fig. S5 Nitrogen adsorption/desorption isotherm and of the post annealing samples: V$_2$O$_5$-0, V$_2$O$_5$-1 and V$_2$O$_5$-2.
**Fig. S6** (a) CV curve of second cycle at a scan rate of 0.2 mV s⁻¹ of sample V₂O₅-1. (b) Galvanostatic charge-discharge voltage profiles of the first cycle at a current density of 58.8 mA g⁻¹ (0.2 C). (c) Electrochemical impedance spectra of all three electrodes measured at the 4th fully discharged state. Inset: The equivalent electrical circuit model for impedance analysis, where \( R_s \) is the electrolyte resistance, \( R_{ct} \) is the charge transfer resistance, \( C_{dl} \) is the double layer capacitance, \( Z_W \) is the Warburg diffusion resistance, \( C_{ps} \) is the pseudocapacitance from V₂O₅ and \( R_{V₂O₅} \) is the internal resistance of the V₂O₅ electrode.
**Fig. S7** Post-mortem FESEM images of electrode films before and after 50 cycles. Low magnification FESEM images of the V$_2$O$_5$-2 electrode film (a) before and (b) after cycles. Representative FESEM images of the samples after cycling (c) V$_2$O$_5$-0, (d) V$_2$O$_5$-1 and (e) V$_2$O$_5$-2.