**Supplementary Material (ESI) for Energy & Environmental Science**

# Three-dimensional porous $V_2O_5$ cathode with a ultra high rate capability

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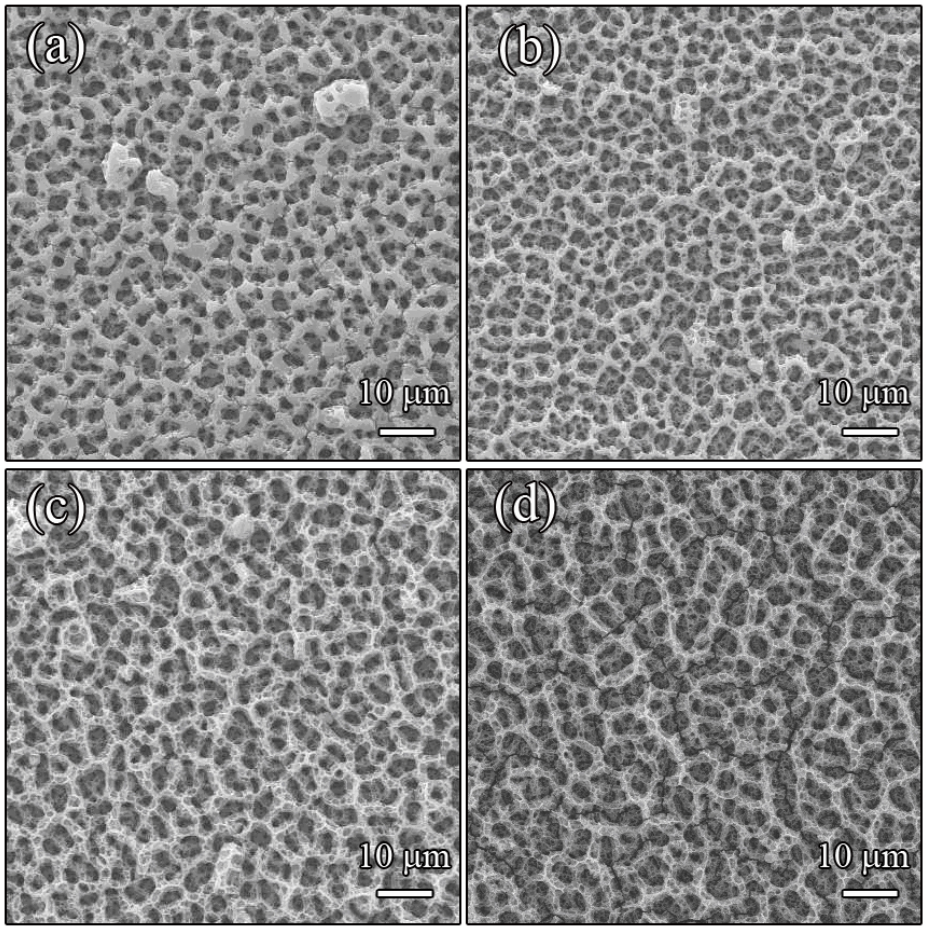


**Figure S1.** Low magnification SEM images of the thin films in different deposit temperatures: (a) 230ºC, (b) 245ºC, (c) 260ºC, (d) 275ºC.

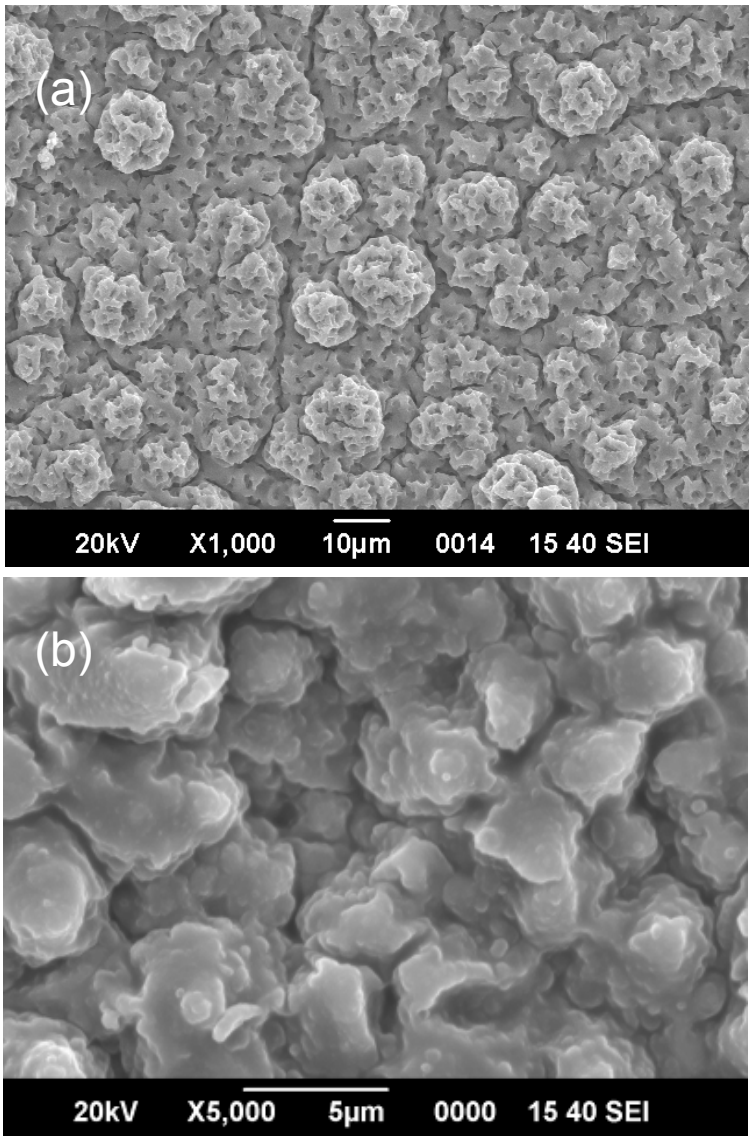


**Figure S2.** SEM image of the vanadium oxide thin film with different solvent: (a) use 1, 2-propylene glycol /Acetone/$H_2O$ mixture as solvent; (b) the ratio of 1, 2-propylene glycol :ethanol:$H_2O$=75:15:10.

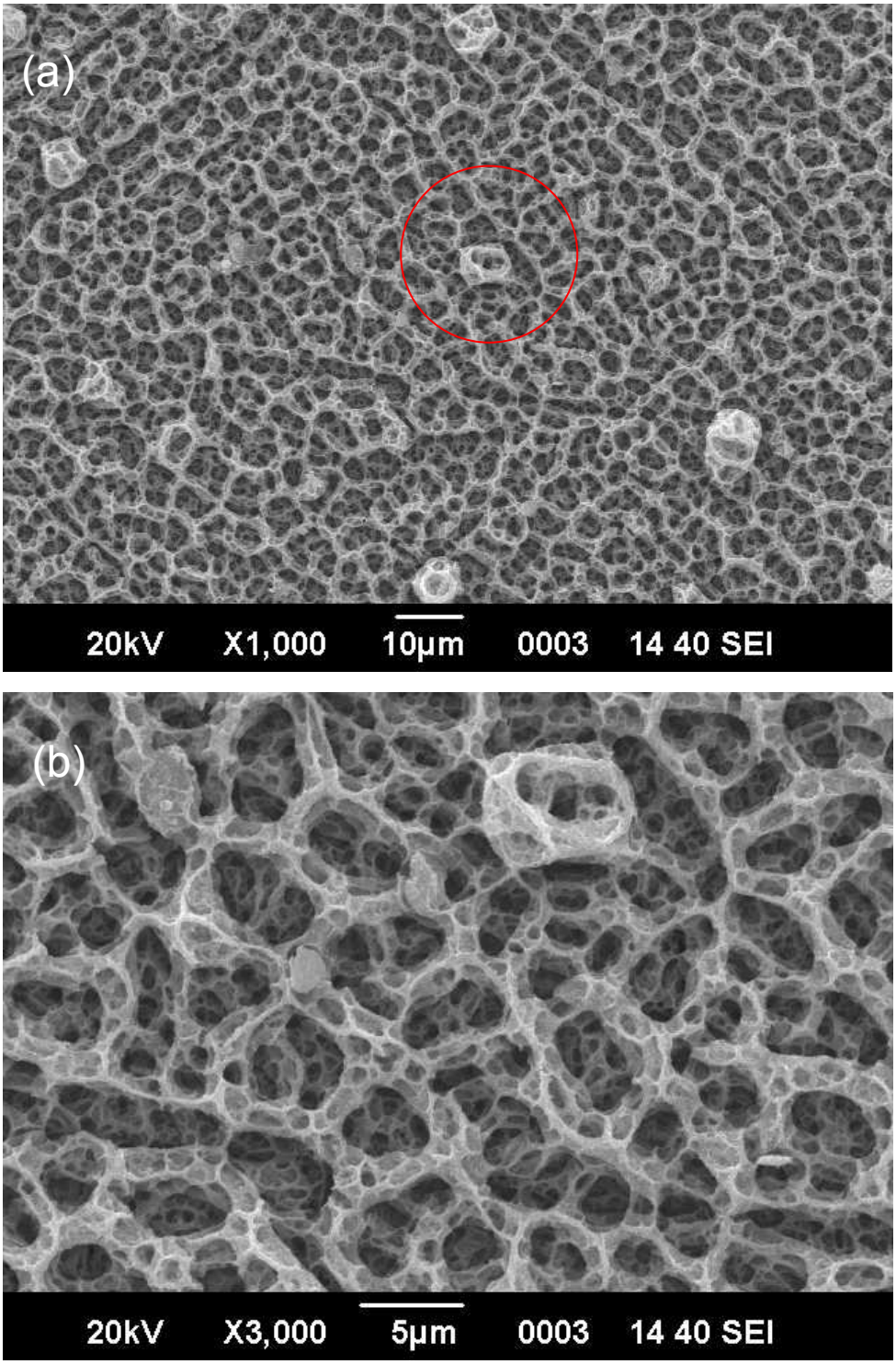


**Figure S3.** SEM images of $V_2O_5$ thin films

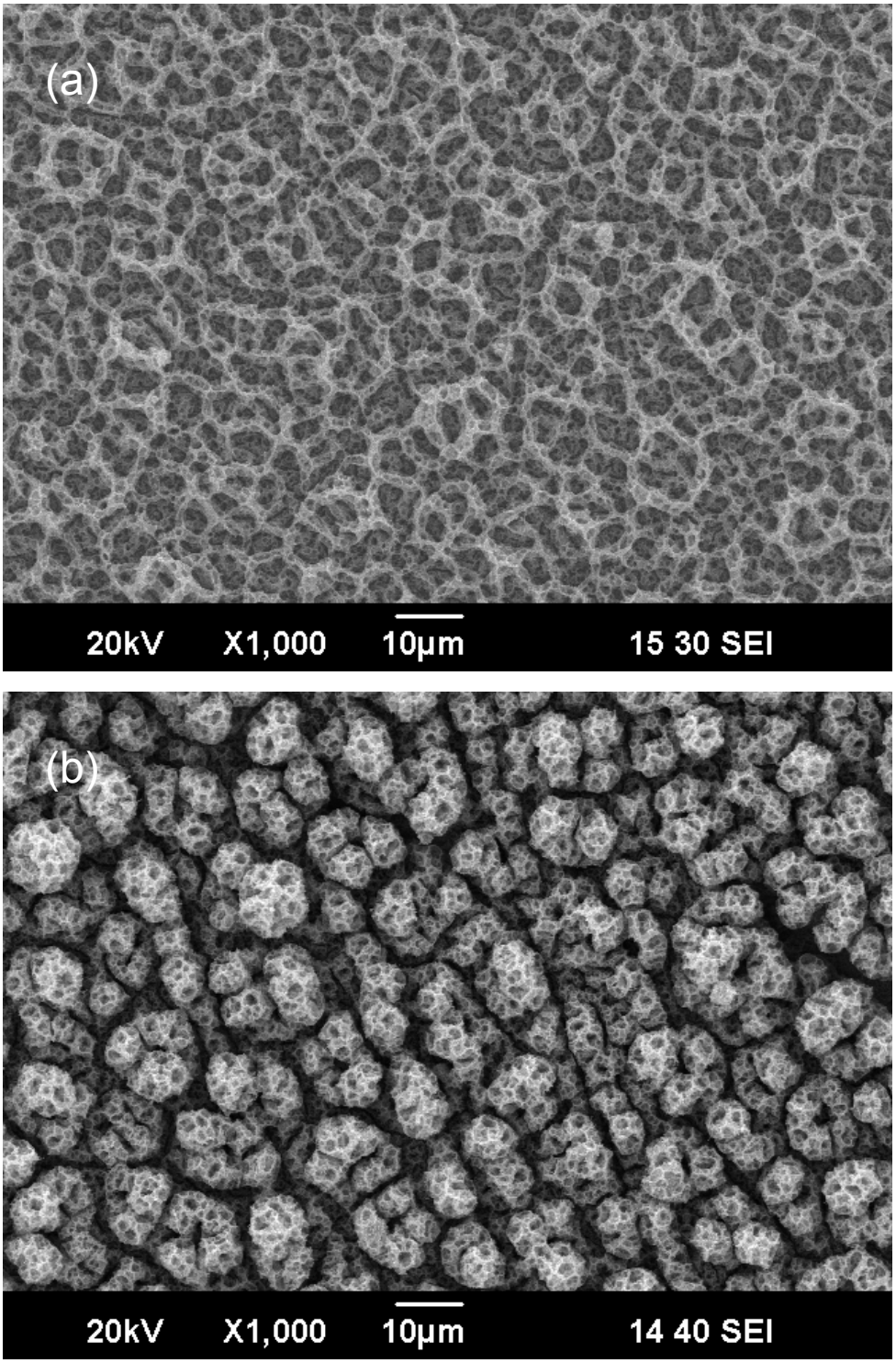


**Figure S4.** SEM images of $V_2O_5$ thin films after annealing at 350ºC for 2h: (a) the deposit time=2h; (b) the deposit time=4h.

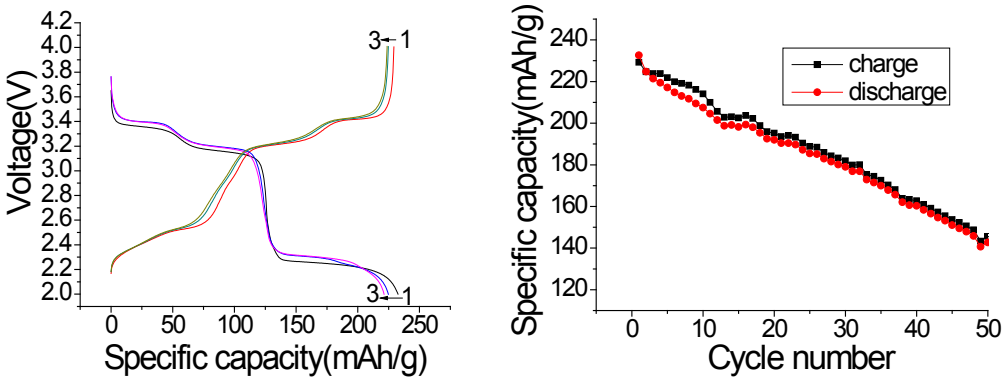


**Figure S5.** Galvanostatic cycling results of 3d-porous $V_2O_5$ thin film in the range of 1.5-4.0V: (a) first three discharge curves at the voltage range of 2.0-4.0 V, (b) cycling performance.

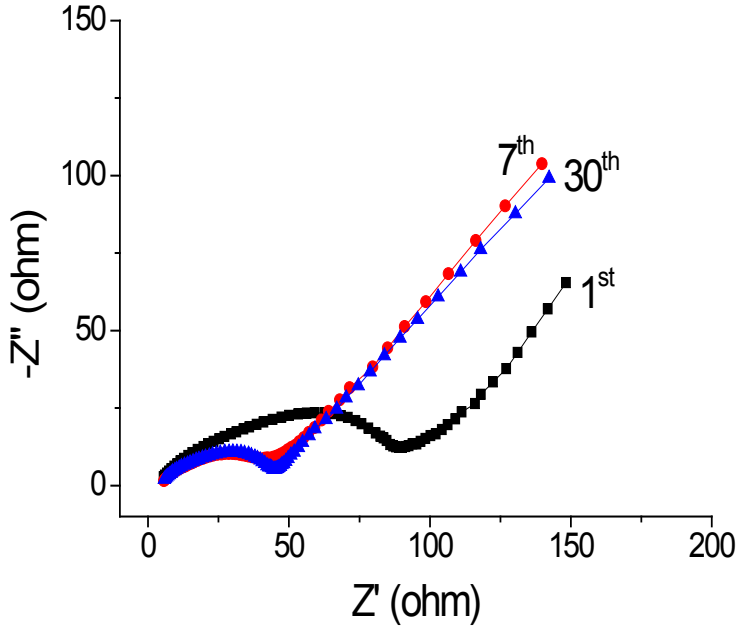


**Figure S6.** AC impedance spectra of $V_2O_5$ /Li cells after charged to 4.0 V in different cycles ($1^{st}$, $7^{th}$, and 30th).