Supporting Information for

High-Performance Flexible Lithium-Ion Electrodes Based on Robust Network Architecture

Xilai Jia,†,a,b Zheng Chen,†,b Arnold Suwarnasarn,c Lynn Rice,b Xiaolei Wang,b Hiesang Sohn,b Qiang Zhang,a Benjamin M. Wu,c Fei Wei*a and Yunfeng Lu*a,b

†Both authors contributed to this work equally.

Please refer to Figure S1 for (a) SEM image and digital photograph (inset) of pristine ultra-long CNT arrays and (b) Digital photograph of ultra-long CNT aerogels from gas sheering; inset shows a TEM image of a single CNT.
Figure S2. Schematic of mechanical testing on CNT/V$_2$O$_5$ composite electrode sheets (a) and (b) toughness of CNT/V$_2$O$_5$ composite electrodes.

As shown in Figure S4 (a), the nanocomposite electrode will be stretched when a load is applied. The mechanical properties can be obtained by $\sigma = \frac{F}{S}$ MPa (stress) and $\varepsilon = \frac{l - l_o}{l_o} \times 100\%$ (strain), where $F$ is the load, $S$ is the cross-section area of the electrode; $l_o$ is the initial length of the electrode between the load, and $l$ is the length of the electrode under tension. After the mechanical test, we can get the stress-strain curves as Figure S4 (b). Then the toughness, which is the work needed to break the film electrode, can be obtained based on integral area under stress-strain curves. Take the 25% CNT/V$_2$O$_5$ as an example, the area under stress-strain curves is $5.1 \times \frac{F}{mm \cdot mm} \times mm \times \frac{1}{100}$, which gives a toughness of $5.1 \times 10^4$ J m$^{-3}$.

Figure S3. (a) SEM image of a film made from pure V$_2$O$_5$ nanowires synthesized without using CNTs; TEM image (b) and SAED (c) of a single V$_2$O$_5$ nanowire.
**Figure S4.** XRD patterns of the CNTs, V$_2$O$_5$ nanowires and CNT/V$_2$O$_5$ nanocomposite (25 wt-% CNTs).

**Figure S5.** Nitrogen sorption isotherms (a) and pore size distribution (b) of CNT/V$_2$O$_5$ nanocomposite electrode containing 25 wt-% of CNTs.
Figure S6. (a) A small disc-shape CNT/V₂O₅ nanocomposite electrode with 25 wt-% of CNTs. (b) The electrode was soaked in 37 wt-% HCl. The light-yellow color indicates the dissolution of V₂O₅ in the acid. (c) Digital photograph of the free-standing CNT sheets after dissolving V₂O₅ nanowires, maintaining its structure integrity.

![Image of CNT/V₂O₅ nanocomposite electrode](image)

Figure S7. The cross-section SEM image of a CNT/V₂O₅ composite made from short CNTs (25 wt-%) under the same synthetic condition.

![Image of cross-section SEM](image)

Figure S8. The cycling stability of a CNT/V₂O₅ composite electrode at low current density of 0.25C.
**Figure S9.** Digital photograph (a) and cross-section SEM images (b and c) of a flexible V$_2$O$_5$/CNT electrode after lithiation.