Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information for:

MoO_3@Ni Nanowire Array Hierarchical Anode for High Capacity and Superior Longevity All-Metal-Oxide Asymmetric Supercapacitors

Chao Xu,[a] Jie Liao,[a] Ruozheng Wang,[a] Peichao Zou,[a] Ronghe Wang,[a] Feiyu Kang,[a,b] Cheng Yang*[a]

[a.] Division of Energy and Environment, Graduate School at Shenzhen, Tsinghua University, Shenzhen 518055, P. R. China, E-mail: yang.cheng@sz.tsinghua.edu.cn

[b.] State Key Laboratory of New Ceramics and Fine Processing, Department of Materials Science and Engineering, Tsinghua University, Beijing 100084, China

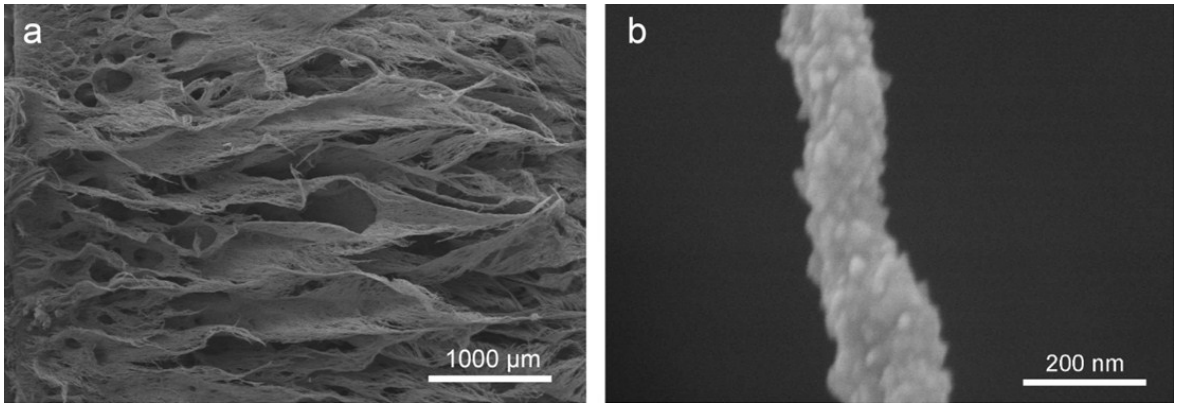

Figure S1. SEM images of NNA at (a) low and (b) high magnifications (top view).

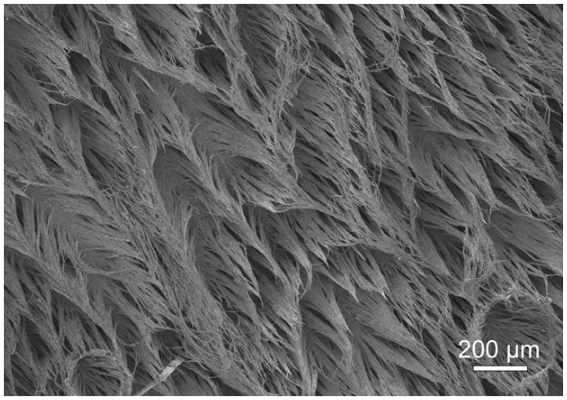

Figure S2. Top view SEM image of MoO_3@NNA electrode.

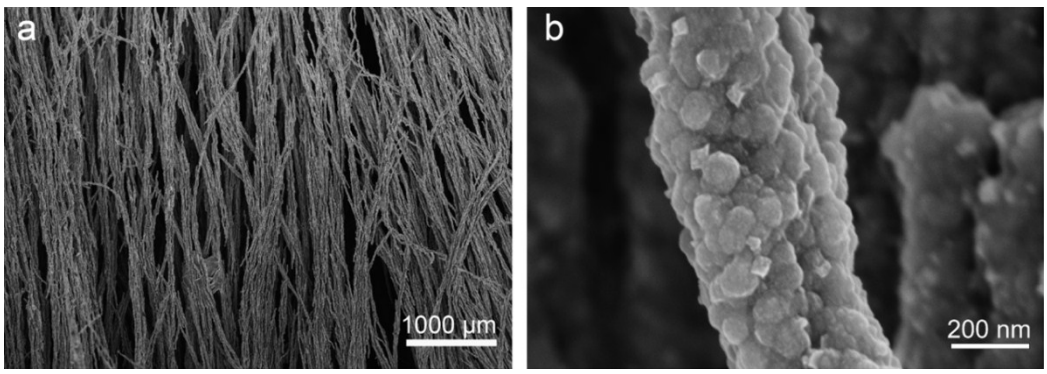

Figure S3. Side-view SEM images of VO2@NNA at low (a) and high (b) magnification.

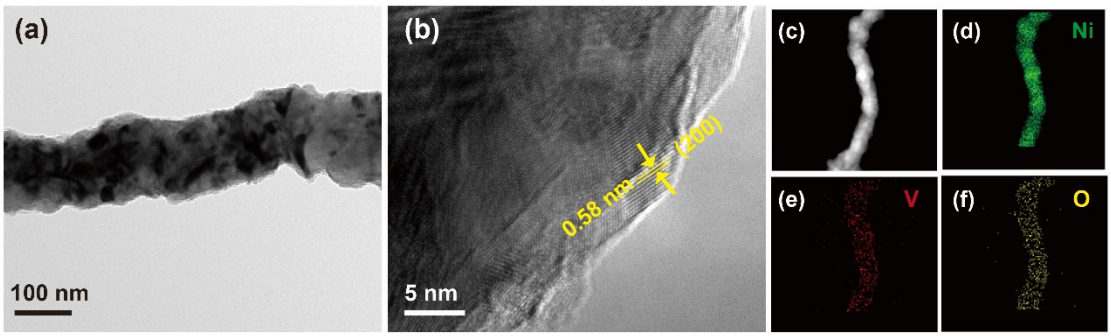

Figure S4. Morphological study on NNA@VO_2 nanostructure. (a). TEM image of NNA@VO_2 electrode. (b). High resolution image of NNA@VO_2 electrode (inset: FFT diffraction pattern focusing on VO_2 shell). (c). STEM image of a piece of NNA@VO2 nanowire, (d)-(f)

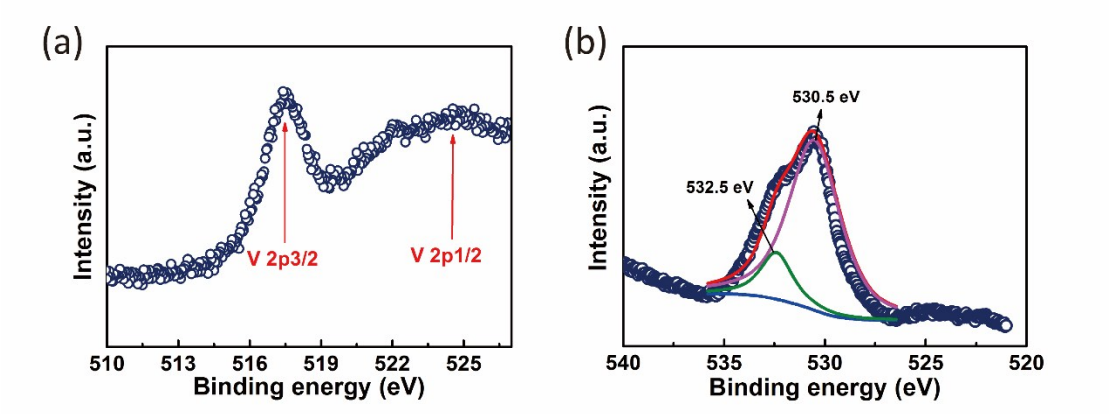

Figure S5. XPS analysis of NNA@VO_2. (a). V 2p spectrums of NNA@VO_2. (b) O 1s spectrum of NNA@VO_2.

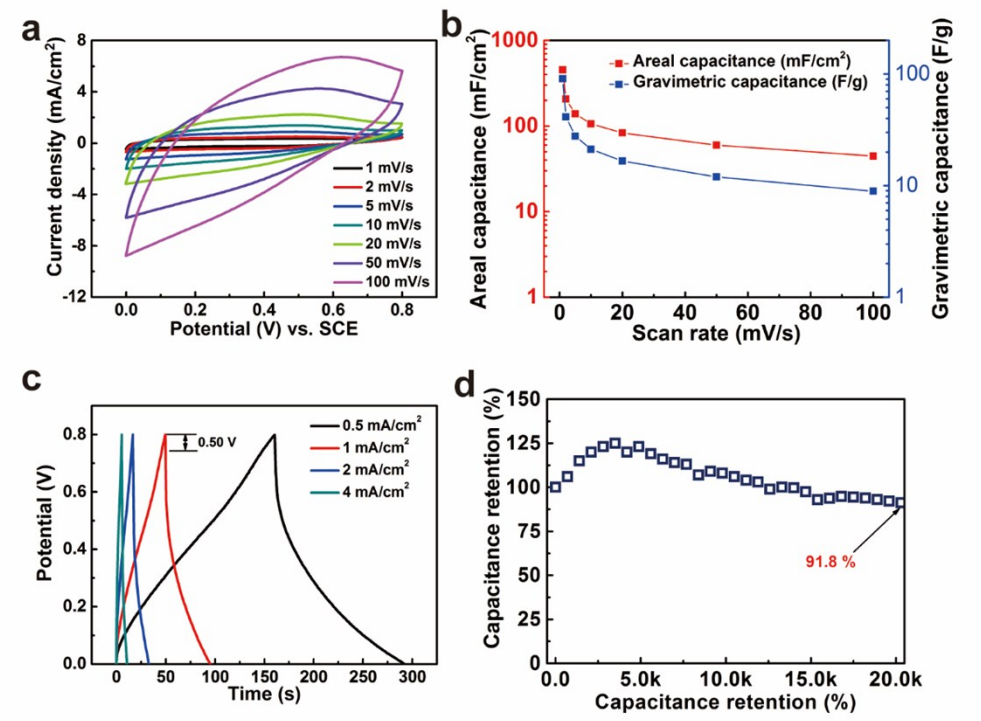

Figure S6. Electrochemical performance of NNA@VO_2 electrode. (a). CV curves of NNA@VO_2 electrode at different scan rate ranging from 1 mV/s to 100 mV/s. (b). Areal and gravimetric capacitance of NNA@VO_2 at different scan rate. (c). GCD curves of NNA@VO_2 electrode at different current densities. (d). Cycling performance of NNA@VO_2 electrode at a constant current density of 20 mA/cm^2.

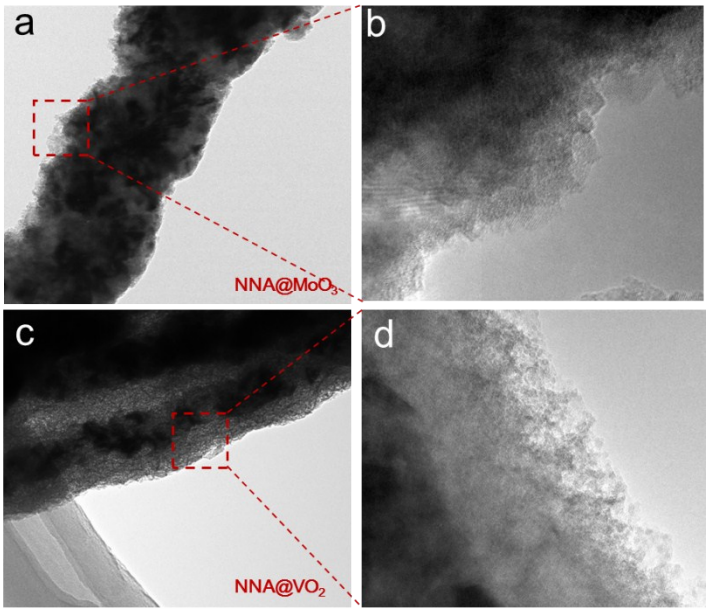

Figure S7. Morphological study on NNA@MoO_3 and NNA@VO_2 nanostructures after cycling. (a)-(b) and NNA@VO_2 (c)-(d) electrodes after 20000 GCD cycles.

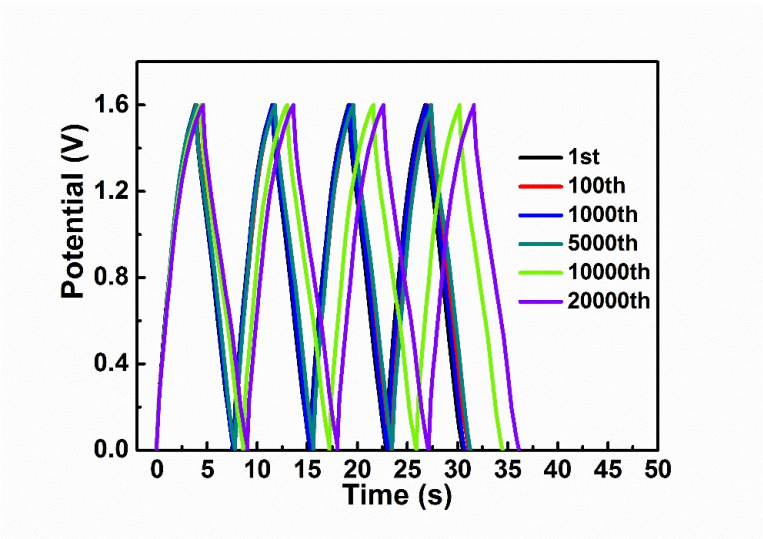

Figure S8. The GCD curves of NNA-ASC for 1st, 100th, 1000th, 5000th, 10000th and 20000th cycles.

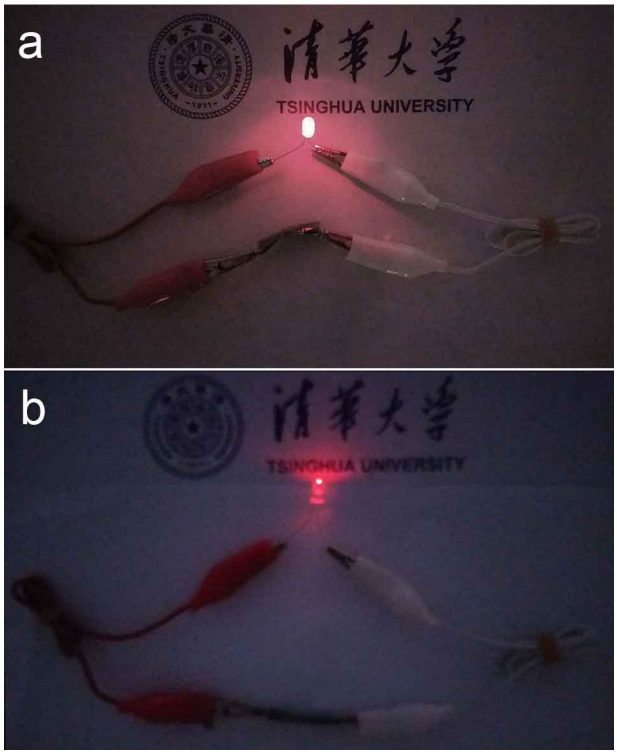

Figure S9. Digital images of the as-assembled NNA-AAS for driving an LED during bending test. (a) After bending the NNA-ASC to 90° by hand and releasing. (b) The NNA-AAS was pressed flat after bending.

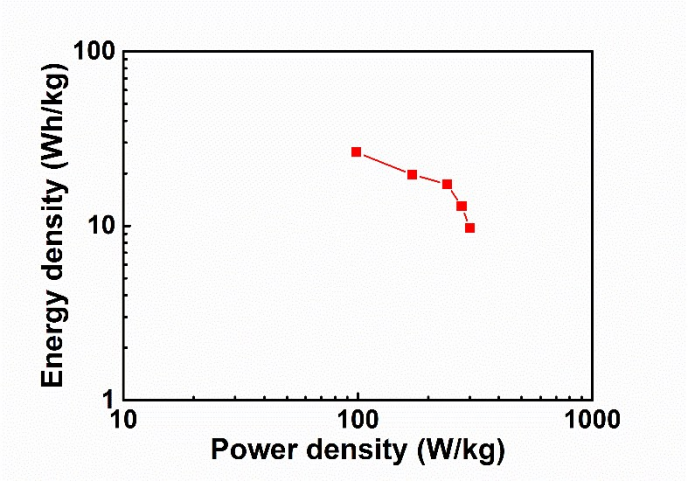

Figure S10. Ragone plot of NNA-ASC based on the total mass of active materials and area of the supercapacitor unit.

Table S1. Comparison on areal capacitance and cycling performance on NNA-ASC and recent advanced energy storage energy storage devices.

Materials	**Maximized areal/volumetric capacitance**	**Cycling performance**	**Ref**
NF-Bi_2O_3//MnO_2-ASC	97 mF cm^{-2} at 1.5 mA cm^{-2}	85 % after 4000 cycles	1
MoO_3/CNT//MnO_2/CNT ASC	4.9 F cm^{-3} at 0.08 A cm^{-3}	83 % after 5000 cycles	2
Fe_2O_3//MnO_2 ASC	0.131 F cm^{-3} at 0.42 mA cm^{-3}	97 % after 5000 cycles	3
$Ni(OH)_2$ NPL symmetric SC	75 mF cm^{-2} and 833 F cm^{-3} at 50 mV s^{-1}	76 % after 10000 cycles	4
NNA-based MoO_3//VO_2 ASC	307 mF cm^{-2} and 6.14 F cm^{-3} at 2 A g^{-1}	116.7 % after 20000 cycles	This work

Note. NNA: Ni nanowire arrays; NF: nano-carbon fiber; CNT, carbon nanotubes; NPL: nanoporous layer;

References

1. H. Xu, X. Hu, H. Yang, Y. Sun, C. Hu and Y. Huang, *Advanced Energy Materials*, 2015, **5**.
2. P. Yang, Y. Chen, X. Yu, P. Qiang, K. Wang, X. Cai, S. Tan, P. Liu, J. Song and W. Mai, *Nano Energy*, 2014, **10**, 108-116.
3. Q. Lv, S. Wang, H. Sun, J. Luo, J. Xiao, J. Xiao, F. Xiao and S. Wang, *Nano letters*, 2016, **16**, 40-47.
4. Y. Yang, G. Ruan, C. Xiang, G. Wang and J. M. Tour, *Journal of the American Chemical Society*, 2014, **136**, 6187-6190.