Electronic supplementary Information

High-Performance Pseudocapacitive Microsupercapacitors with Three-Dimensional Current Collector of Vertical ITO Nanowire Arrays

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Calculation

The areal capacitance from CV curves can be calculated by Eq. 1:

$$C_A = \frac{\int I(v)dv}{AVS} \quad (1)$$

Where C_A is the areal capacitance (mF cm^{-2}), I is the response current (A), A is the area of electrodes (cm^2), V is the voltage window (V), and S is the scan rate (mV s^{-1}). The specific capacitance from GCD curves can be calculated by Eq. 2:

$$C_A = \frac{I\Delta t}{AV} \quad (2)$$

Where C_A is the areal capacitance (mF cm^{-2}), I is the discharge current (A), A is the area of electrode (cm^2), Δt is the discharge time (s), and V is the voltage window (V).

The areal energy density of the device can be calculated by the Eq. 3:

$$E_A = \frac{C * V^2}{2} \quad (3)$$

and the areal power density is given by Eq. 4:

$$P_A = \frac{E}{t} \quad (4)$$

Where E_A is the areal energy density (Wh cm^{-2}), C is the areal capacitance (mF cm^{-2}) calculated by GCD curves, V is the voltage window (V), P_A is the areal power density (W cm^{-2}), and t is the discharge time (s).

The volumetric energy density of the device can be calculated by the Eq. 3:

$$E_V = \frac{C * V^2}{2 * h} \quad (5)$$

and the volumetric power density is given by Eq. 4:

$$P_V = \frac{E}{t} \quad (6)$$

Where E_V is the energy density (Wh cm^{-3}), C is the areal capacitance (mF cm^{-2}) calculated by GCD curves, V is the voltage window (V), h is the thickness of electrode (cm), P_V is the volumetric power density (W cm^{-3}), and t is the discharge time (s).

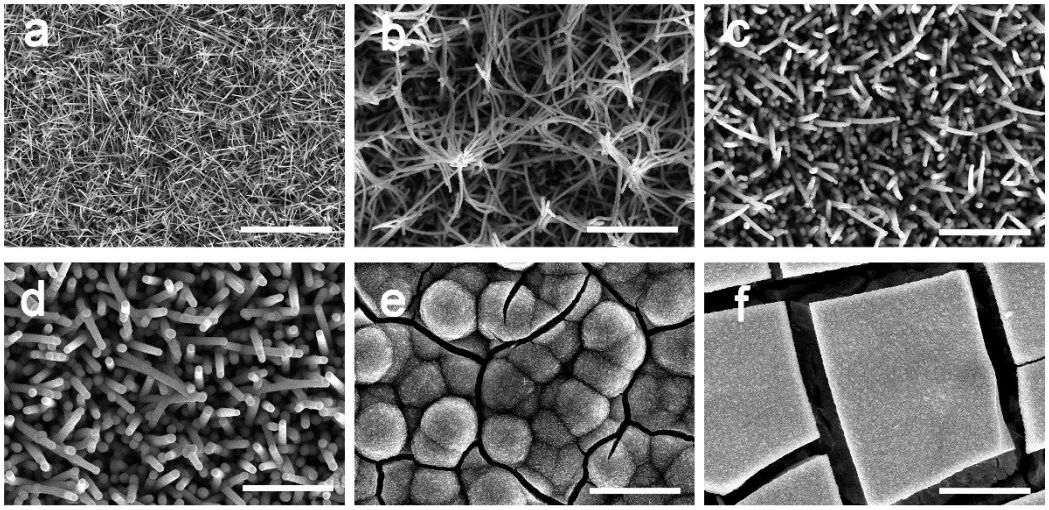

Fig. S1 SEM images of ITO NWs-MnO_2 based electrodes with different ED time of (a) 0 min, (b)

40 min, (c) 90 min, (d) 120 min, (e) 240 min, (f) 360 min. Scale bar is 10 μm.

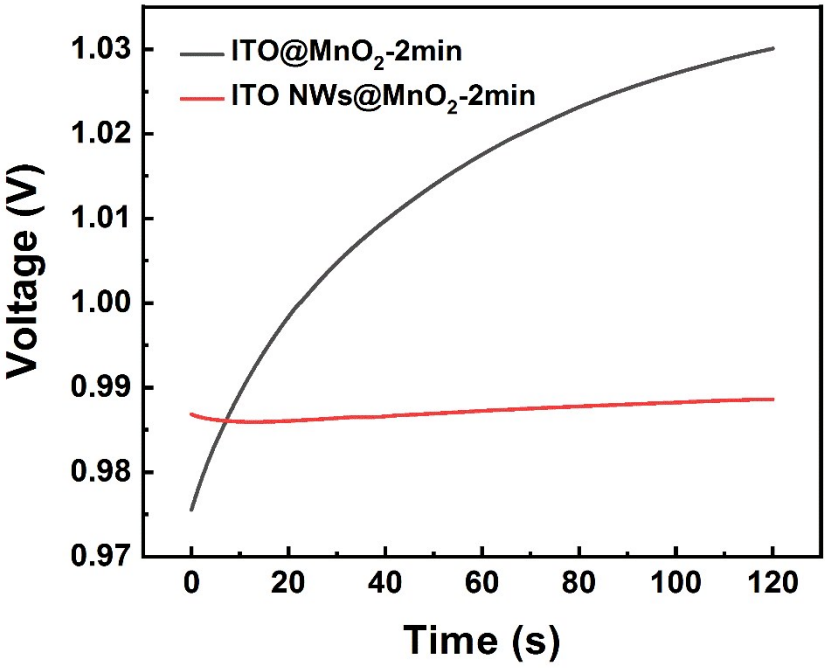

Fig. S2 The comparison of voltage-time curves between ITO NWs@MnO_2-2 and ITO@MnO_2-2 under the process of CCED.

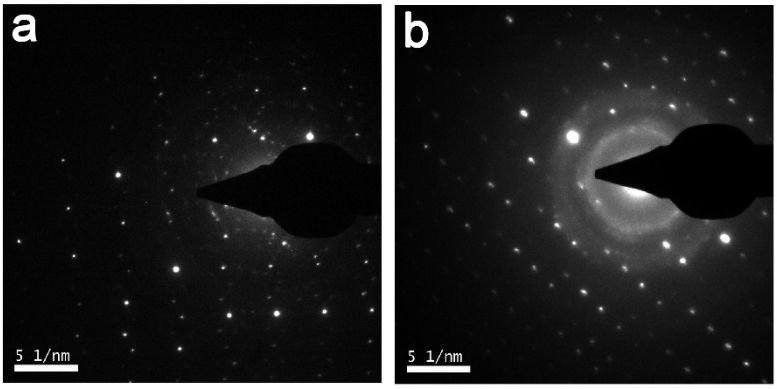

Fig. S3 SEAD images of (a) ITO NWs and (b) ITO NWs@MnO_2.

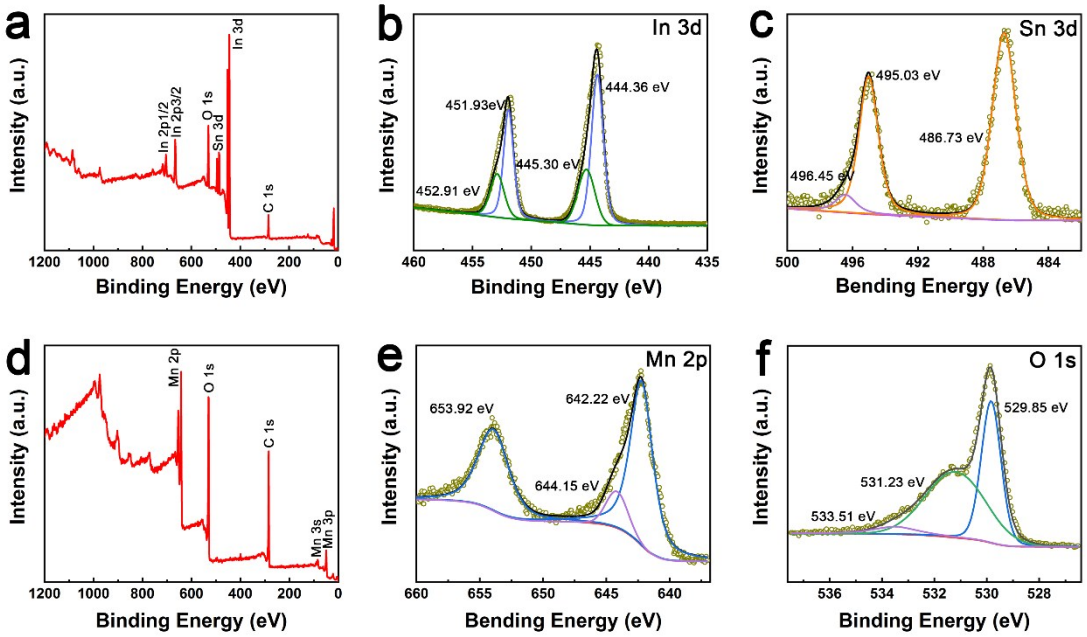

Fig. S4 (a) XPS survey spectrum of ITO NWs. (b) and (c) show the level spectrum of In and Sn of ITO NWs, respectively. (d) XPS survey spectrum of ITO NWs@MnO_2-360. (e) and (f) show the level spectrum of Mn and O of ITO NWs, respectively.

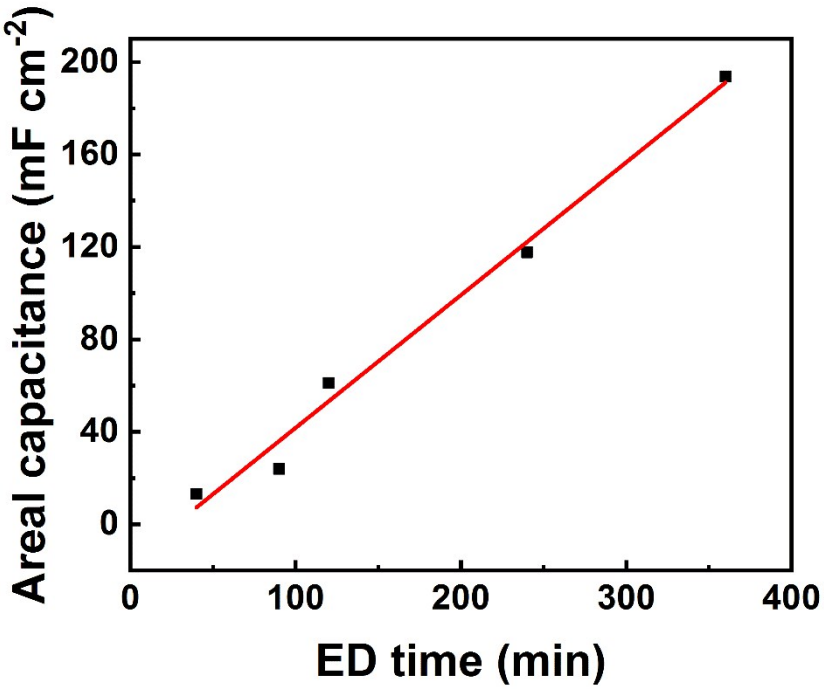

Fig. S5 A fitting linear relationship observed between areal capacitance and ED time of MnO_2.

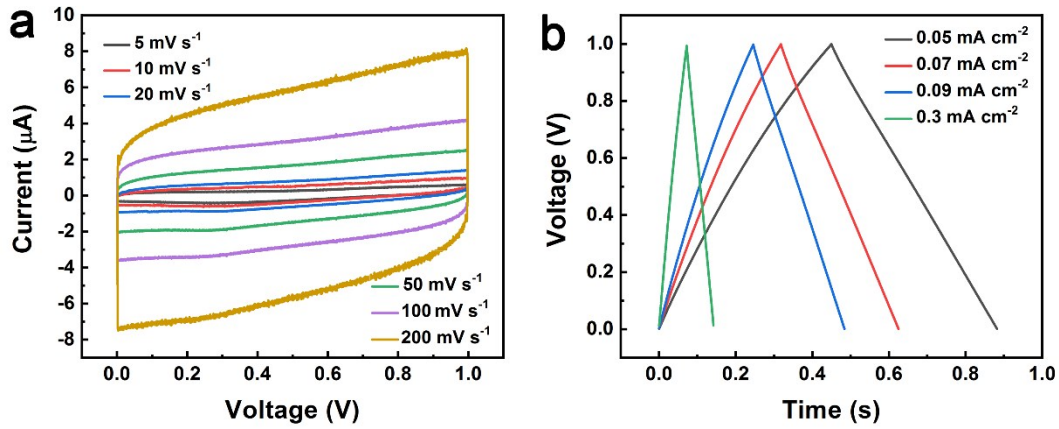

Fig. S6 (a) CV curves and (b) GCD curves of ITO NWs@MnO_2-0.

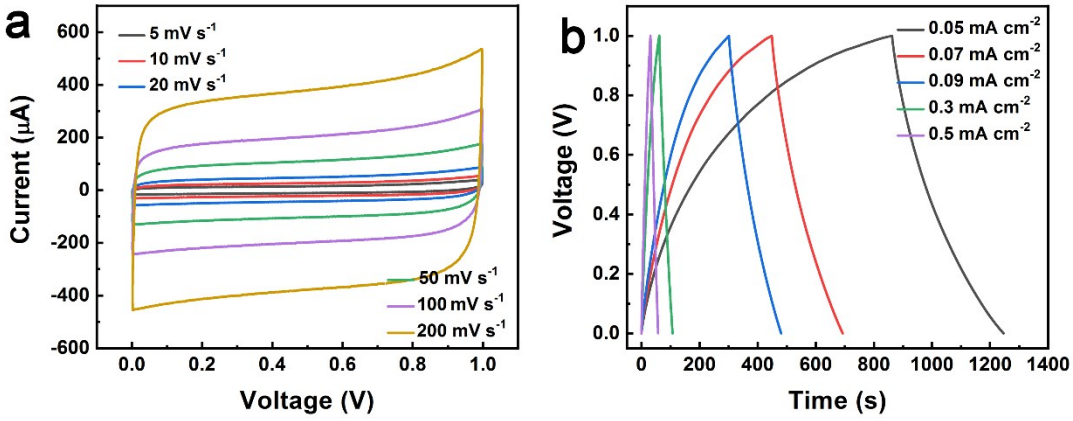

Fig. S7 (a) CV curves and (b) GCD curves of ITO NWs@MnO_2-40.

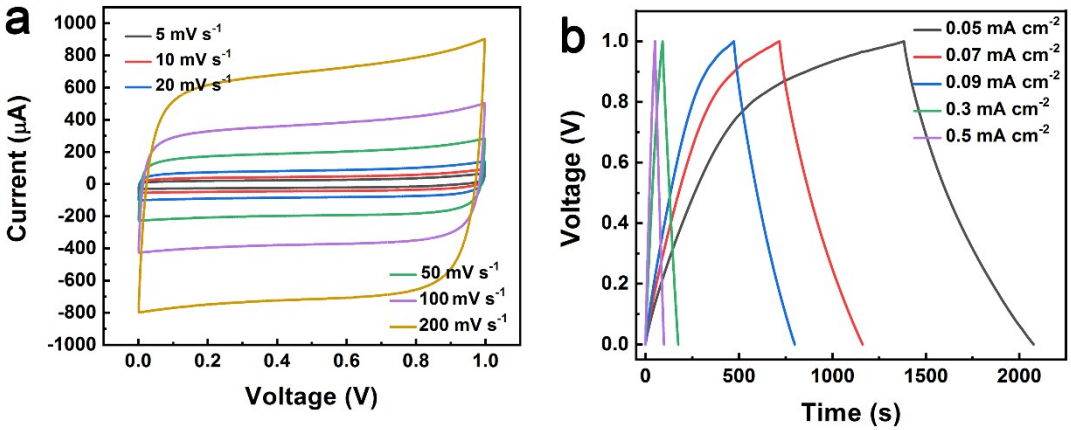

Fig. S8 (a) CV curves and (b) GCD curves of ITO NWs@MnO_2-90.

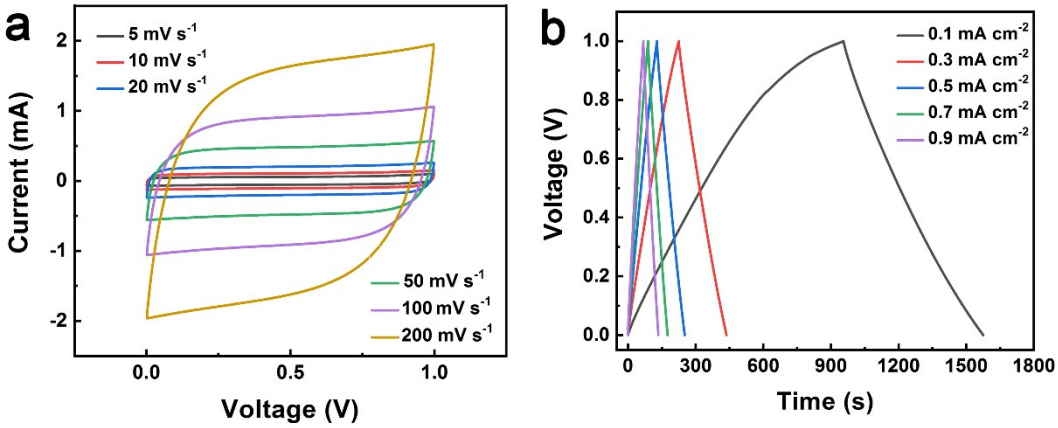

Fig. S9 (a) CV curves and (b) GCD curves of ITO NWs@MnO_2-120.

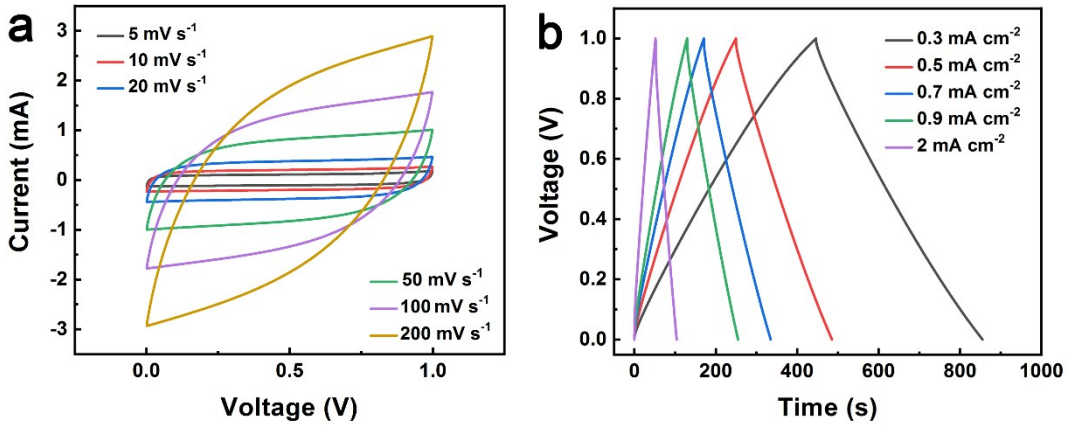

Fig. S10 (a) CV curves and (b) GCD curves of ITO NWs@MnO_2-240.

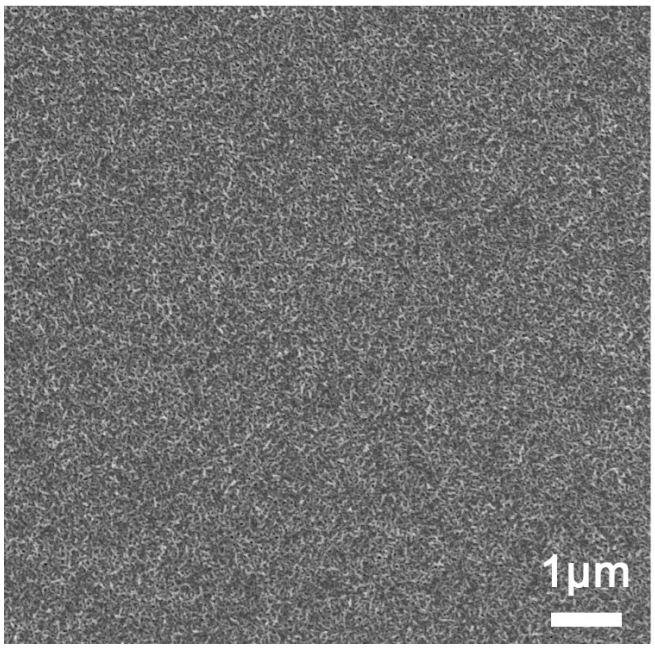

Fig. S11 SEM image of ITO-MnO_2-2.