Supporting Information

for

Synergistic Effect in Heterostructure of $ZnCo_2O_4$ and Hydrogenated Zinc Oxide Nanorods for High Capacitive Response

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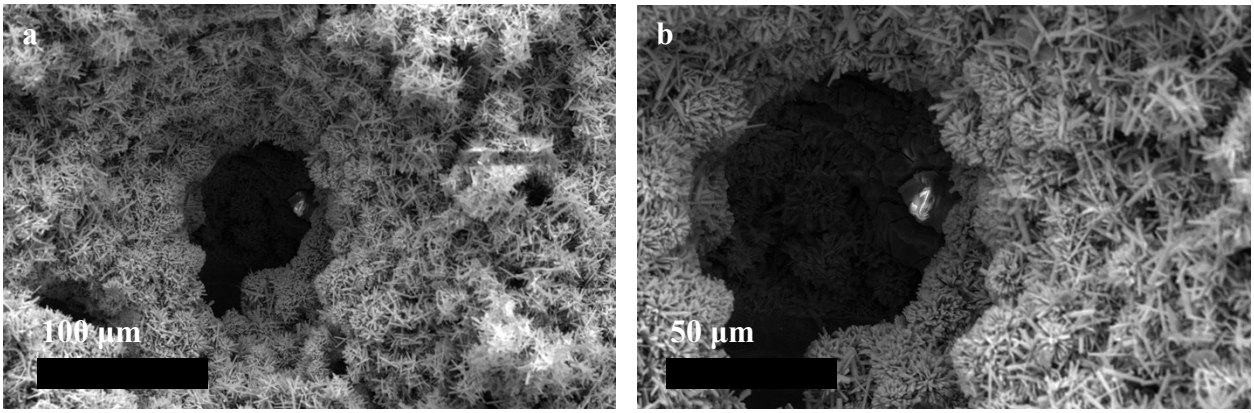

Fig. S1: (a) and (b) are the low-magnification SEM images of as-grown $ZnCo_2O_4$/H:ZnO NRs on NiF.

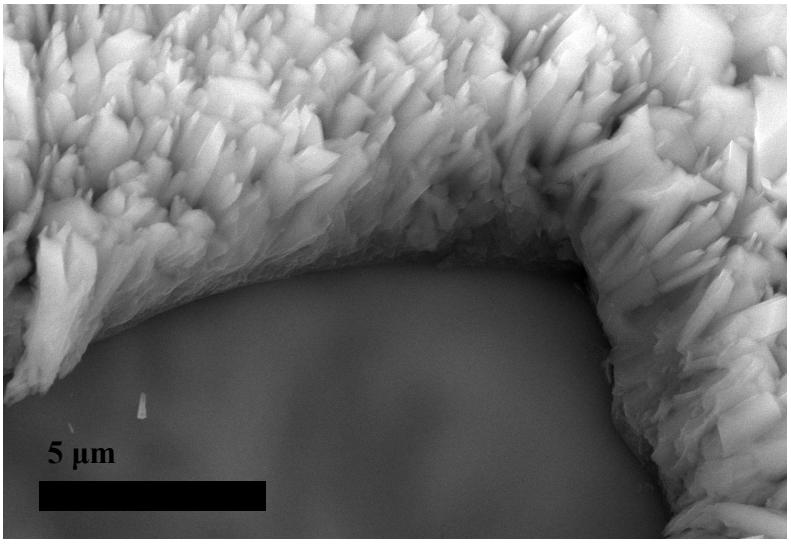

Fig. S2: Cross-sectional SEM image of as-grown $ZnCo_2O_4$ on NiF.

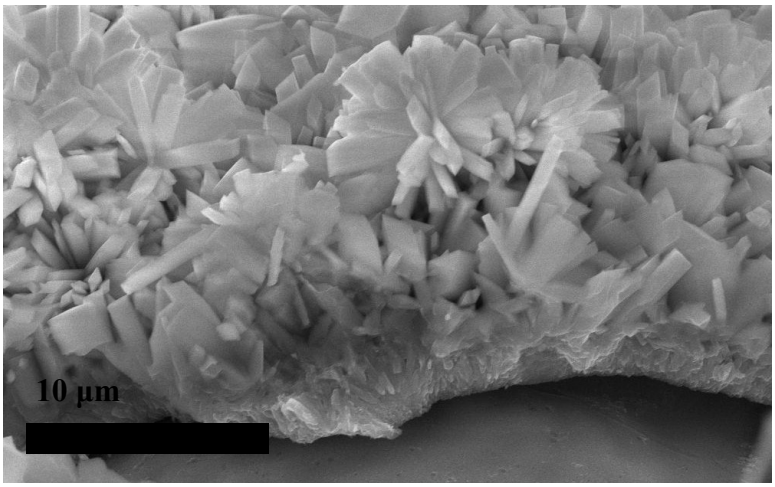

Fig. S3: Cross-sectional SEM image of as-grown $ZnCo_2O_4$/H:ZnO NRs on NiF.

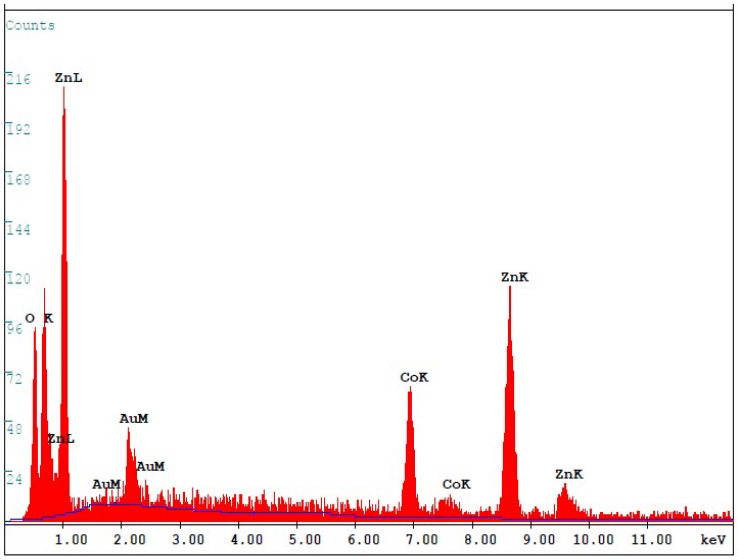

Fig. S4: EDS spectrum of $ZnCo_2O_4$/H:ZnO NRs

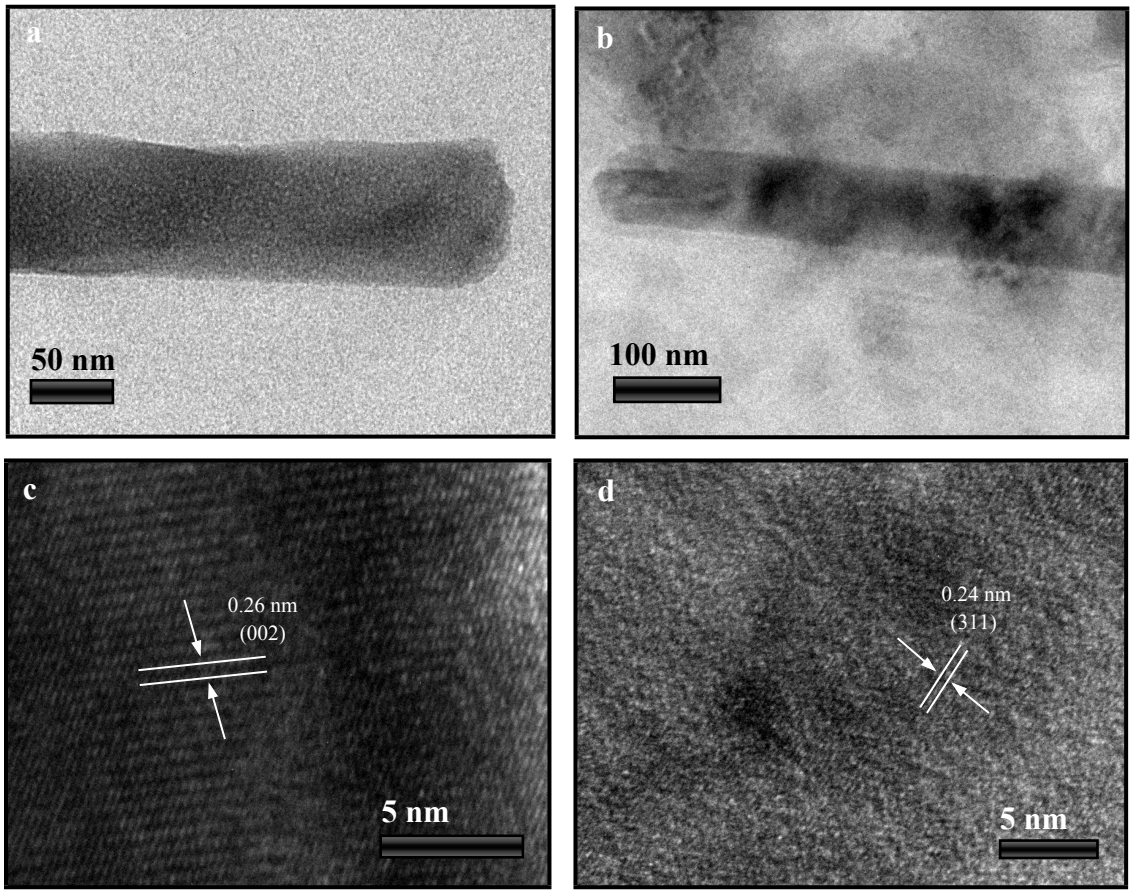

Fig. S5: TEM images ((a) and (b)) and HRTEM images ((c) and (d)) of pristine H:ZnO NR and $ZnCo_2O_4$ NR, respectively.

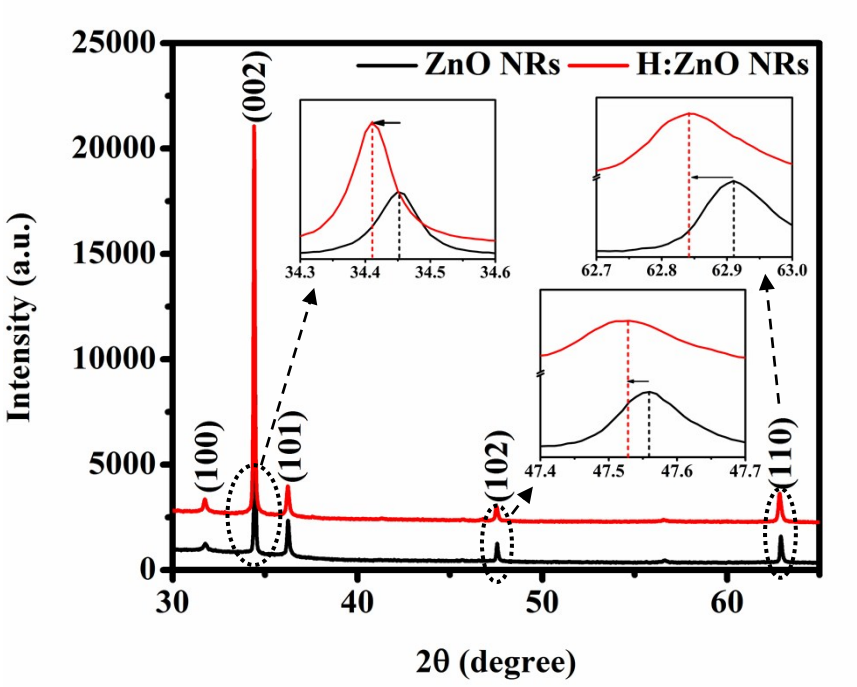

Fig. S6: Comparison XRD patterns of pristine ZnO NRs and H:ZnO NRs.

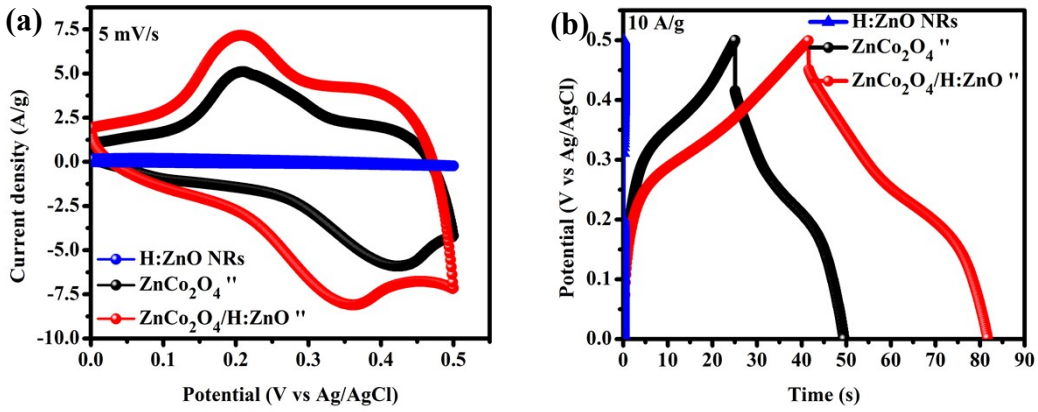

Fig. S7: (a) CV comparisons of the as-fabricated electrodes such as H:ZnO, $ZnCo_2O_4$ and $ZnCo_2O_4$/H:ZnO NRs at the same scan rate of 5 mV/s with a potential window of 0 - 0.5 V. (b) Charging-discharging plot of the as-fabricated electrodes in the same potential window and same current density of 10 A/g.

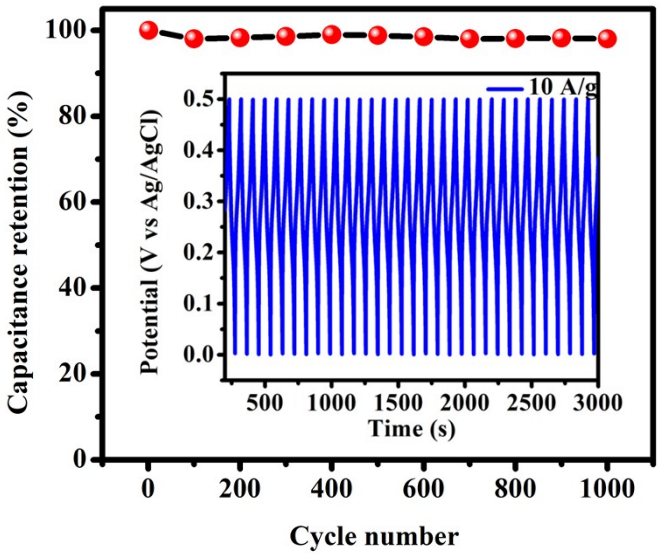

Fig. S8: Capacitance retention plot of the $ZnCo_2O_4$/H:ZnO NRs electrode. Inset depicts the few representative charge-discharge cycles of the electrode.

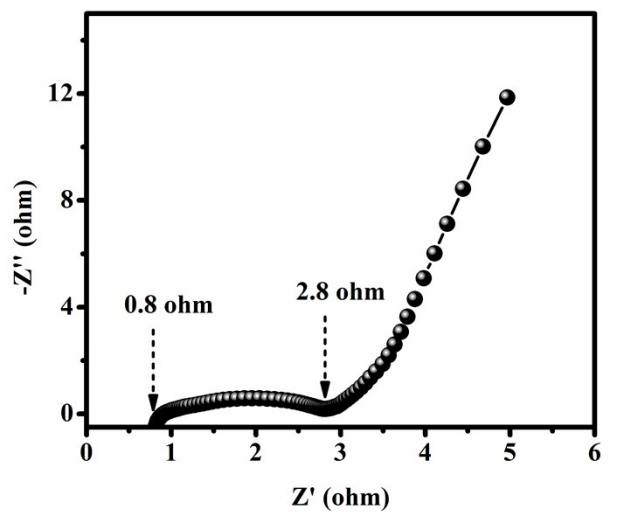

Fig. S9: Nyquist plot of the $ZnCo_2O_4$/H:ZnO NRs electrode.

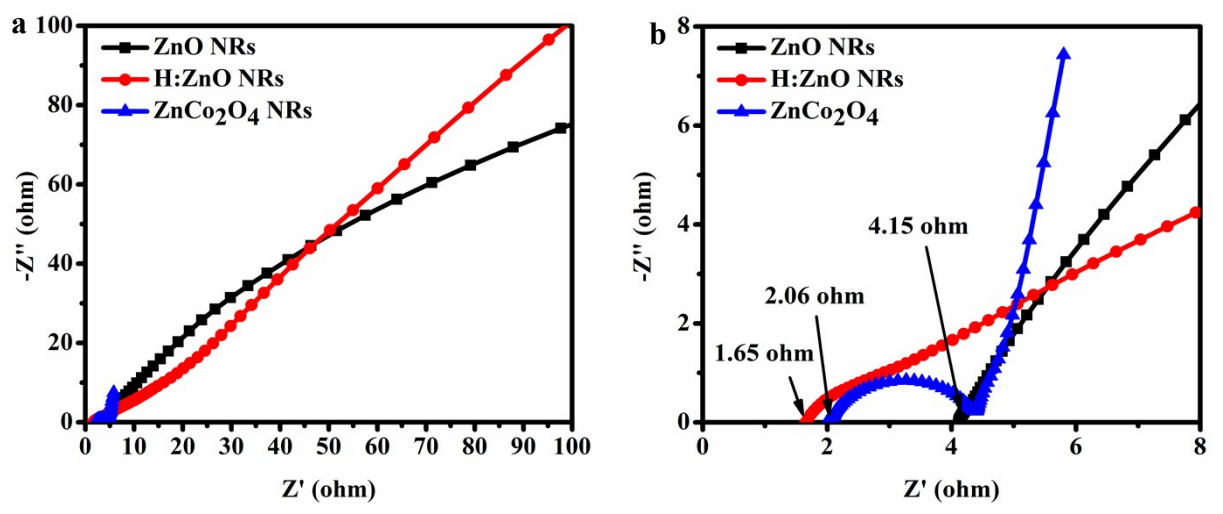

Fig. S10: Nyquist plots of ZnO NRs, H:ZnO NRs and $ZnCo_2O_4$ NRs electrodes.

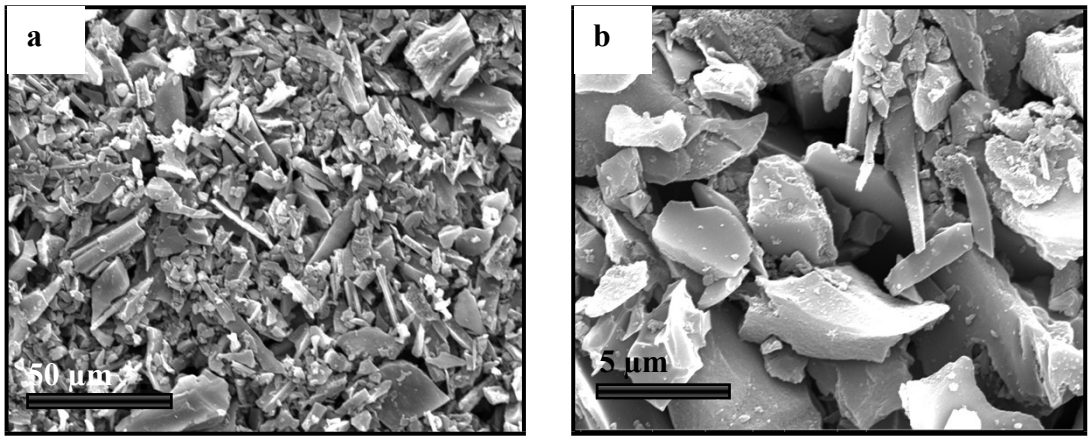

Fig. S11: SEM images of AC at (a) low and (b) high magnifications.

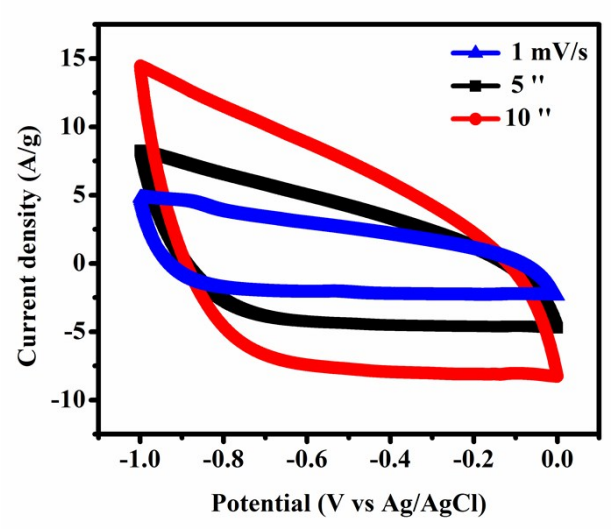

Fig. S12: CV plots of the AC electrode at different scan rates varying from 1 to 10 mV/s.

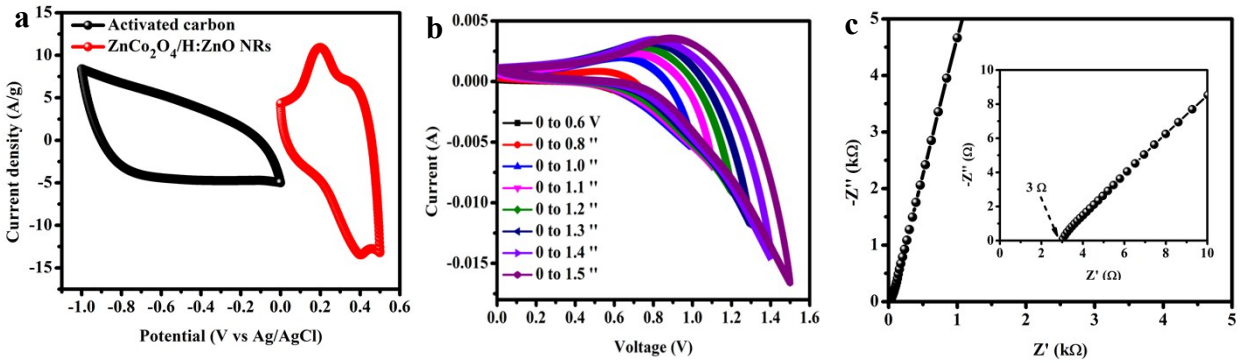

Fig. S13: (a) CV curve of $ZnCo_2O_4$/H:ZnO NRs and AC at the same scan rate of 5 mV/s in the respective potential windows. (b) CV analysis of the asymmetric $ZnCo_2O_4$/H:ZnO NRs//AC supercapacitor at different potential window in a fixed scan rate of 20 mV/s. (c) Nyquist plot of the $ZnCo_2O_4$/H:ZnO NRs//AC asymmetric supercapacitor (inset shows the magnified view in the high frequency range).

Table S1: Specific capacitance, energy and power densities of the $ZnCo_2O_4$/H:ZnO NRs//AC supercapacitor at different current densities.

Current density	**Potential**	**Specific Capacitance**	**Specific Energy density**	**Specific Power density**
A/g	ΔV (V)	F/g	Wh/kg	W/kg
1	1.4	13.8	3.75667	653.34
1.6	1.32	12.7	3.0734	928.99
2	1.3	10.67	2.50449	1127.02

Table S2: Areal capacitance, areal energy and power densities of the $ZnCo_2O_4$/H:ZnO NRs//AC supercapacitor at different current densities.

Current I	**Current density** I/A	**Discharge time** Δt	**Potential** ΔV	**Areal Capacitance,** $C_{A,cell} = I\Delta t/A\Delta V$	**Areal Energy density** $E_A = \frac{1}{2} \times \frac{C_{A,cell} \times \Delta V^2}{3600}$	**Areal Power density** $P_A = \frac{E_A}{\Delta t} \times 3600$
mA	mA/cm^2	s	(V)	mF/cm^2	μWh/cm^2	μW/cm^2
5	2.5	20.7	1.4	37	10.0625	1750
8	4	11.91	1.32	36	8.734	2640
10	5	8	1.3	31	7.22222	3250