Electronic Supplementary Material (ESI) for Nanoscale.

Supported Information

Configuring hierarchical Ni/NiO 3D-network assisted with bamboo cellulose nanofibers for high-performance Ni-Zn aqueous batteries

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Calculations:

Specific capacity values of single electrode and battery were calculated from the galvanostatic discharge curves by the following equation:

$$C = \frac{It}{m}$$

where C is specific capacity (mAh.g-1), m refers to the loading mass of active materials (g), I corresponds to the discharging density (A), t represents the discharge time (h).

The energy density (E) and power density (P) were calculated from the equations as below:

$$E = \int_0^{\Delta t} IV(t)dt$$

$$P = \frac{E}{1000 \times \Delta t}$$

where the unit of E is Wh.kg^{-1}and that of P is kW.kg^{-1}. Δt is the discharge time (h), I corresponds to the discharging density (A), V refers to the discharging voltage (V) and dt represents time differential.

The mass ratios of bamboo cellulose nanofibers to the nickel of $Ni(NO_3)_2$ were calculated from the following equations:

$$m_r = \frac{m_1}{n \times N \div 1000}$$

where the unit of m_r is g/g. m_1 is the mass of bamboo cellulose nanofibers (g), which is 0.2 in this experiment. n is the amount of $Ni(NO_3)_2$ (mmol, and n=2,4,6). N is the molar mass of nickel (N=58.69).

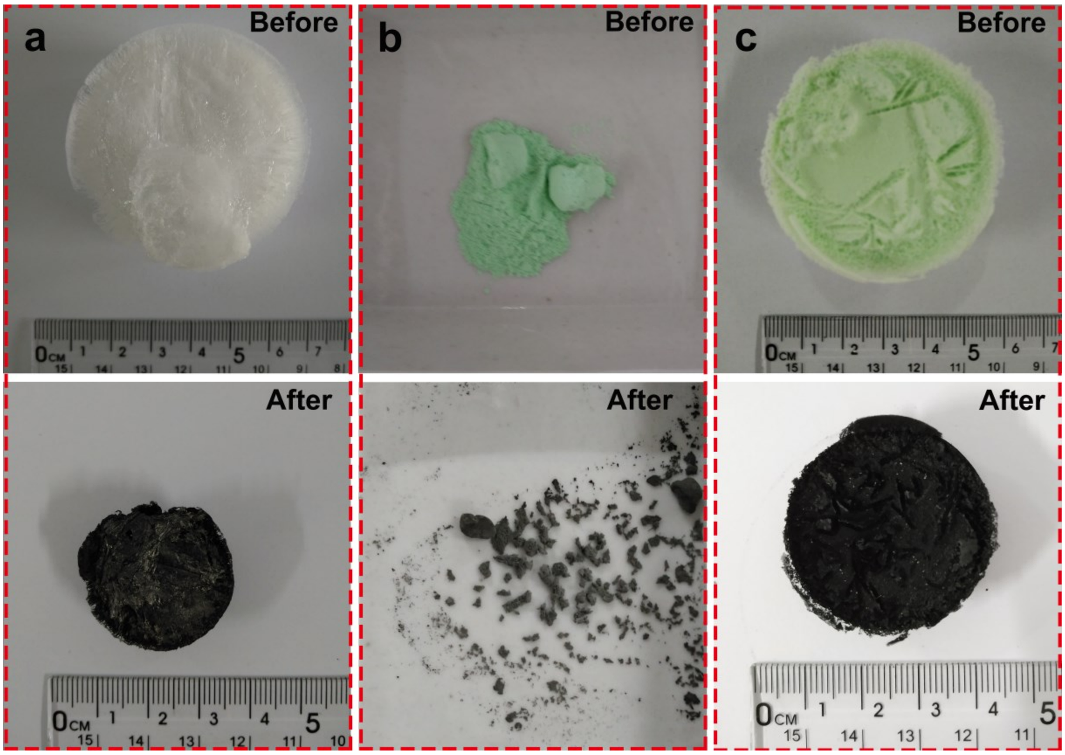

Figure S1. The macroscopic morphology of (a) BCF, (b) pure nickel, and (c) Ni-BCF before and after calcination

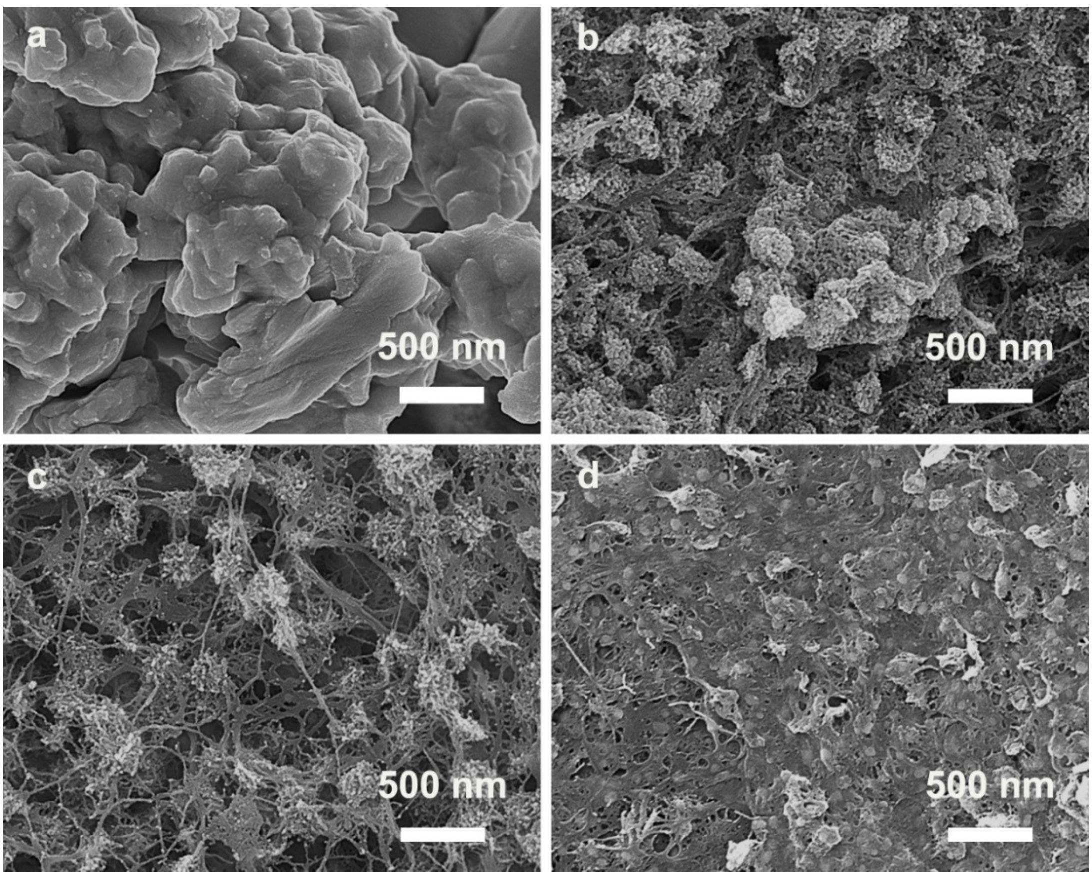

Figure S2. The SEM images of (a) pure Ni, (b) Ni-BCF0.57, (c) Ni-BCF0.85 and (d) Ni-BCF1.7

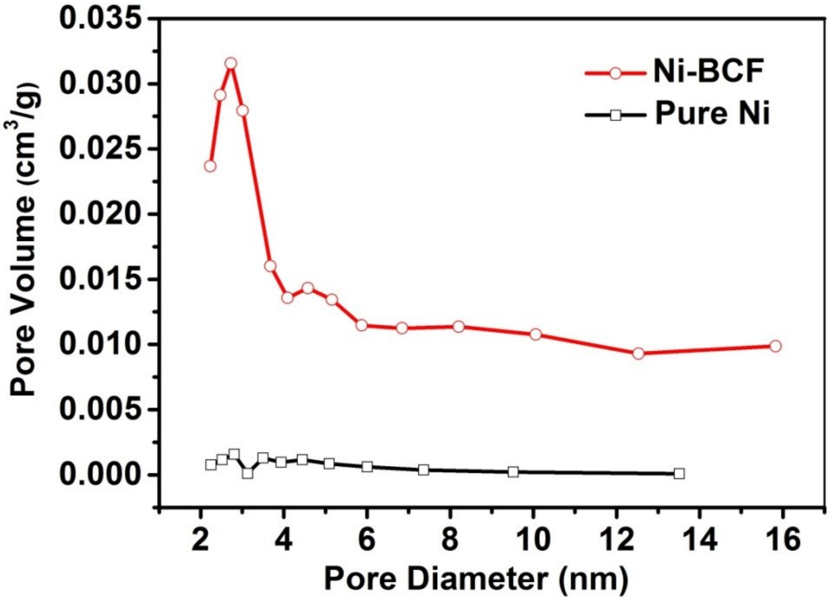

Figure S3. The pore size distribution of Ni-BCF and pure Ni

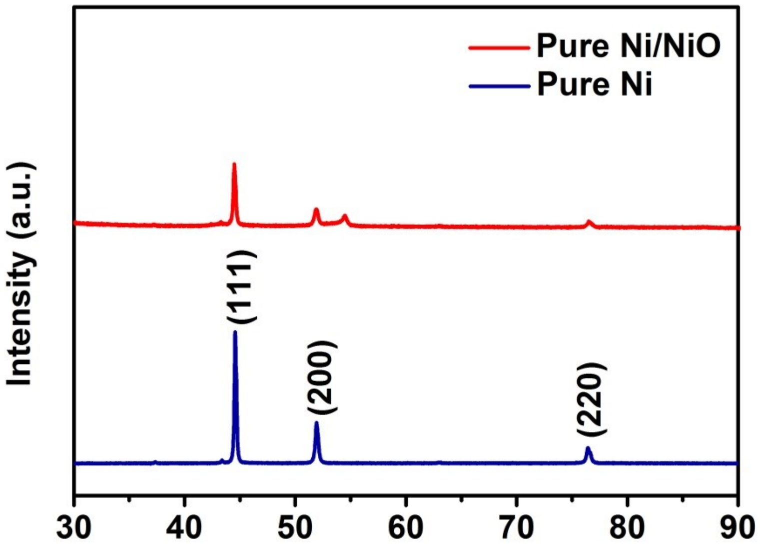

Figure S4. XRD pattern of pure Ni and pure Ni/NiO

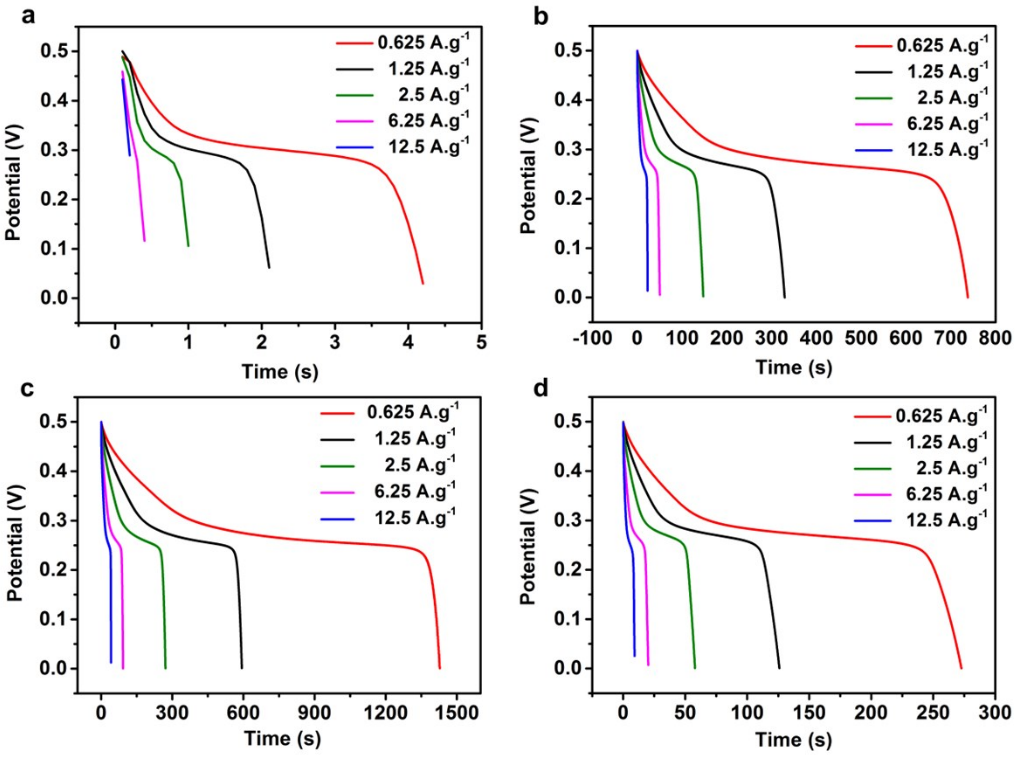

Figure S5. The discharge curves of (a) pure Ni, (b) Ni-$BCF_{0.57}$, (c) Ni-$BCF_{0.85}$, and (d) Ni-$BCF_{1.7}$ at different current densities

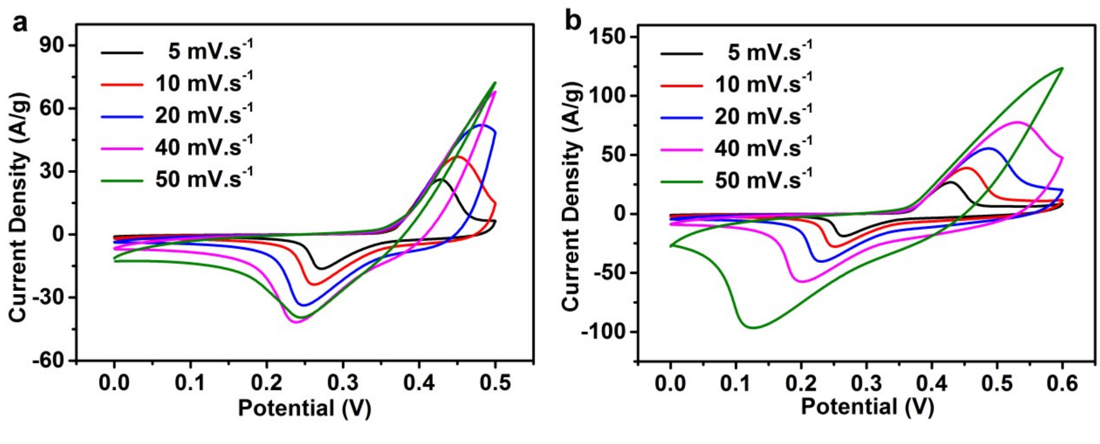

Figure S6. CV curves of Ni/NiO-$BCF_{0.85}$ electrode with different potential window of (a) 0-0.5V and (b) 0-0.6V

Table S1. Cycling performance of different nickel-based electrodes

Electrode structure	Electrolyte	Cycling stability	Reference
Ni/NiO-BCF hierarchical networks	6 M KOH	94.5% after 2000 cycles	**This work**
Porous net-like β-$Ni(OH)_2$/γ-NiOOH	1 M KOH	81% after 1000 cycles	1

$NiCo_2O_4$@MnO_2 core-shell nanowire array	1 M LiOH	88% after 2000 cycles	2
Ni-MOF nanosheet/carbon nanotube fiber	2 M KOH	79.6% after 2000 cycles	3
Co_3O_4@NiO nanostrip@nanorod arrays	6 M KOH	96% after 1000 cycles	4
Ni_3S_2 honeycomb-like nanosheet	1 M KOH	89% after 1000 cycles	5
$Ni(OH)_2$ nanosheets/nitrogen-doped graphene	1 M KOH	93% after 1000 cycles	6

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Table S2. Cycling performance of different aqueous rechargeable batteries

Battery	Electrolyte	Cycling stability	Reference
Ni/NiO//Zn	6 M KOH+0.5 M $Zn(Ac)_2$	94.5% after 1000 cycles	**This work**

Ni-MOF/CNTF//Zn	2M KOH saturated with ZnO	89% after 600 cycles	1
$Ni(OH)_2$//ZnO/C	6M KOH saturated with ZnO	89% after 800 cycles	2
$NiCo_2O_4$//Zn	6 M KOH+0.1M $Zn(Ac)_2$	63.23% after 1000 cycles	3
NiO-CNTs//Zn	1 M KOH +10 mM $Zn(Ac)_2$	65% after 500 cycles	4
Co_3O_4@NiO NSRAs//Zn	6M KOH saturated with ZnO	89% after 500 cycles	5
CC-CF@NiO//CC-CF@ZnO	2M KOH saturated with ZnO	91.45% after 1000 cycles	6
NCHO//Zn	6 M KOH	60% after 1000 cycles	7
$Ni(OH)_2$/NG//Fe	1 M KOH	93% after 1000 cycles	8

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