Supplementary Information

MXene quantum dots rivet reinforced Ni-Co LDH for boosting electrochemical activity and cycling stability

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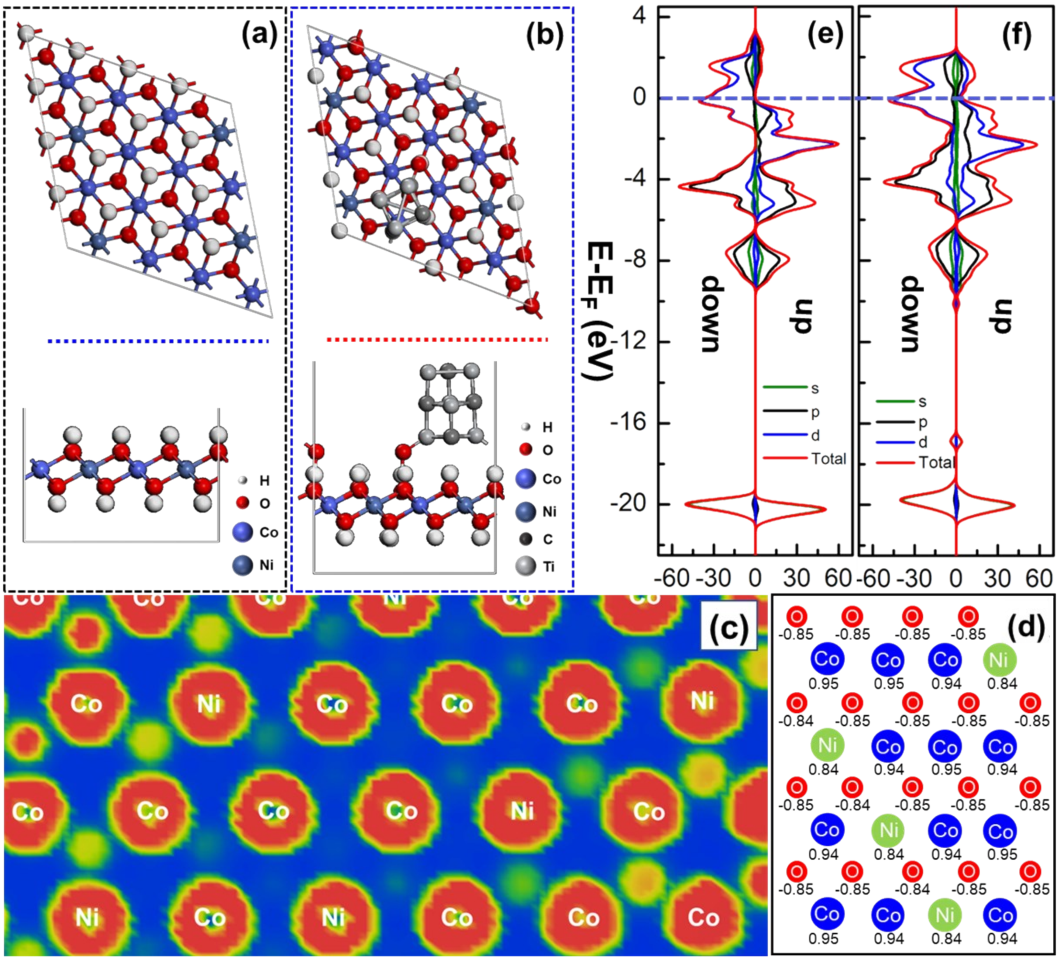

Fig. S1. (a, b) Calculated models of primary Ni-Co LDH and Ni-Co LDH@MQDs. (c, d) ELF mapping and calculated net charge of Ni, Co and O atoms in the primary Ni-Co LDH. (e, f) PDOS of the Ni-Co LDH and Ni-Co LDH@MQDs.

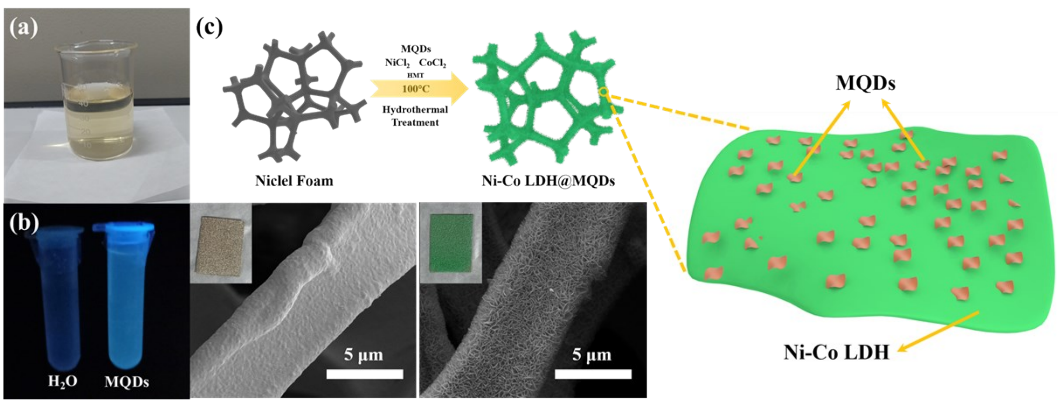

Fig. S2. (a) Physical diagram of MQDs aqueous solution. (b) Photoluminescence of MQDs under 365 nm UV light. (c) Schematic illustration of the preparation Ni-Co LDH@MQDs

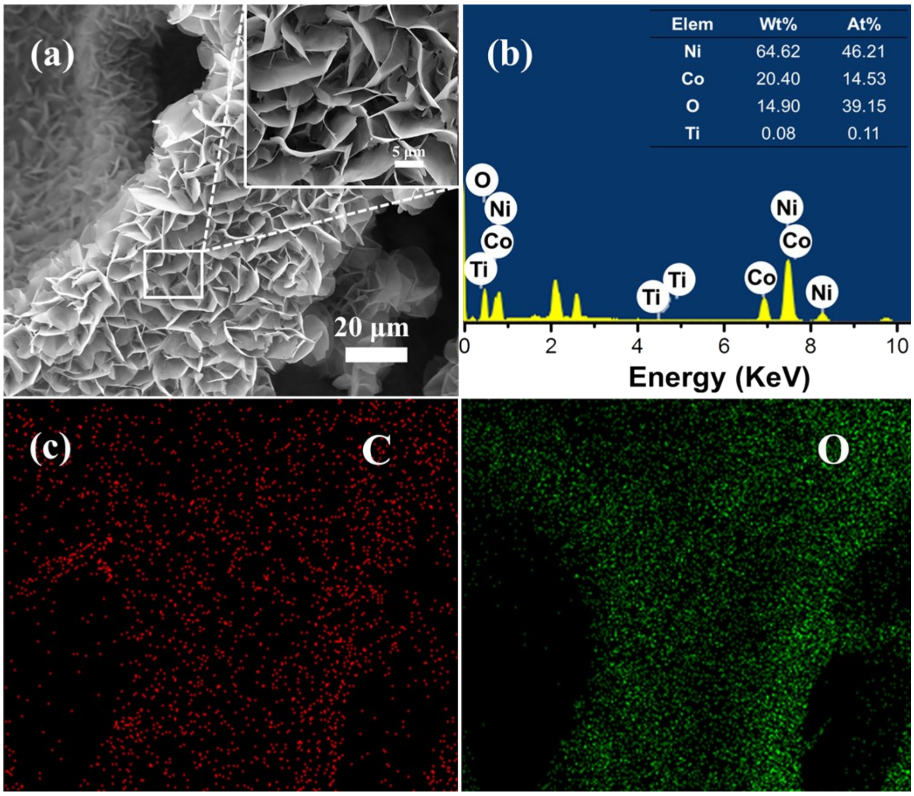

Fig. S3. (a) SEM image of Ni-Co LDH. (b) EDS spectrum and the table of element content. (c) uniform distribution (C, O) in Ni-Co LDH@MQDs.

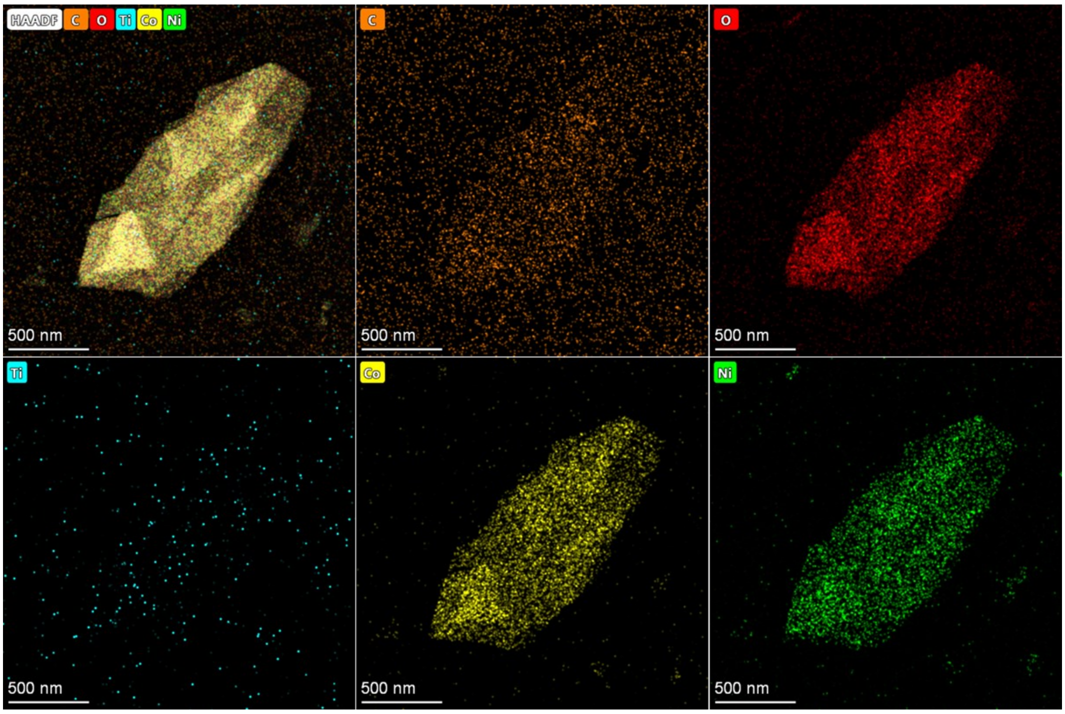

Fig. S4. The high-angle annular dark-field (HADDF)-STEM image and elemental mapping images.

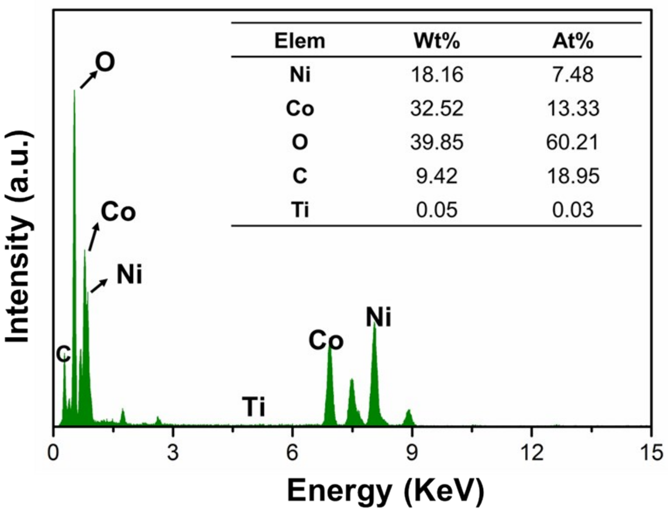

Fig. S5. The element contents of Ni-Co LDH@MQDs in the STEM image at Fig. S4.

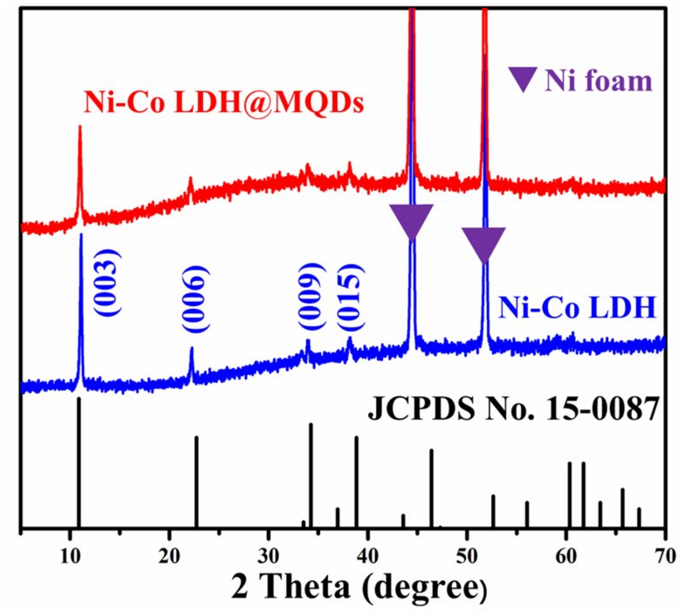

Fig. S6. XRD patterns of Ni-Co LDH and Ni-Co LDH@MQDs on Ni foam.

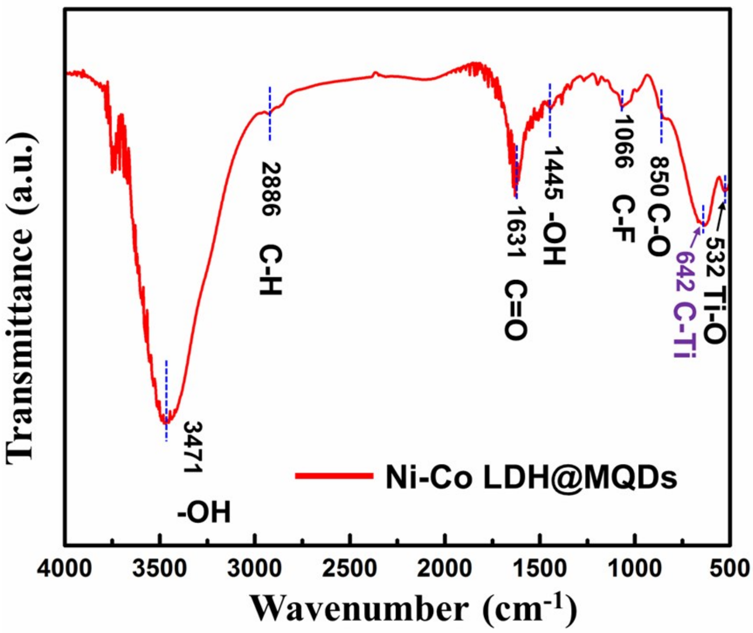

Fig. S7. FT-IR spectrum of Ni-Co LDH@MQDs.

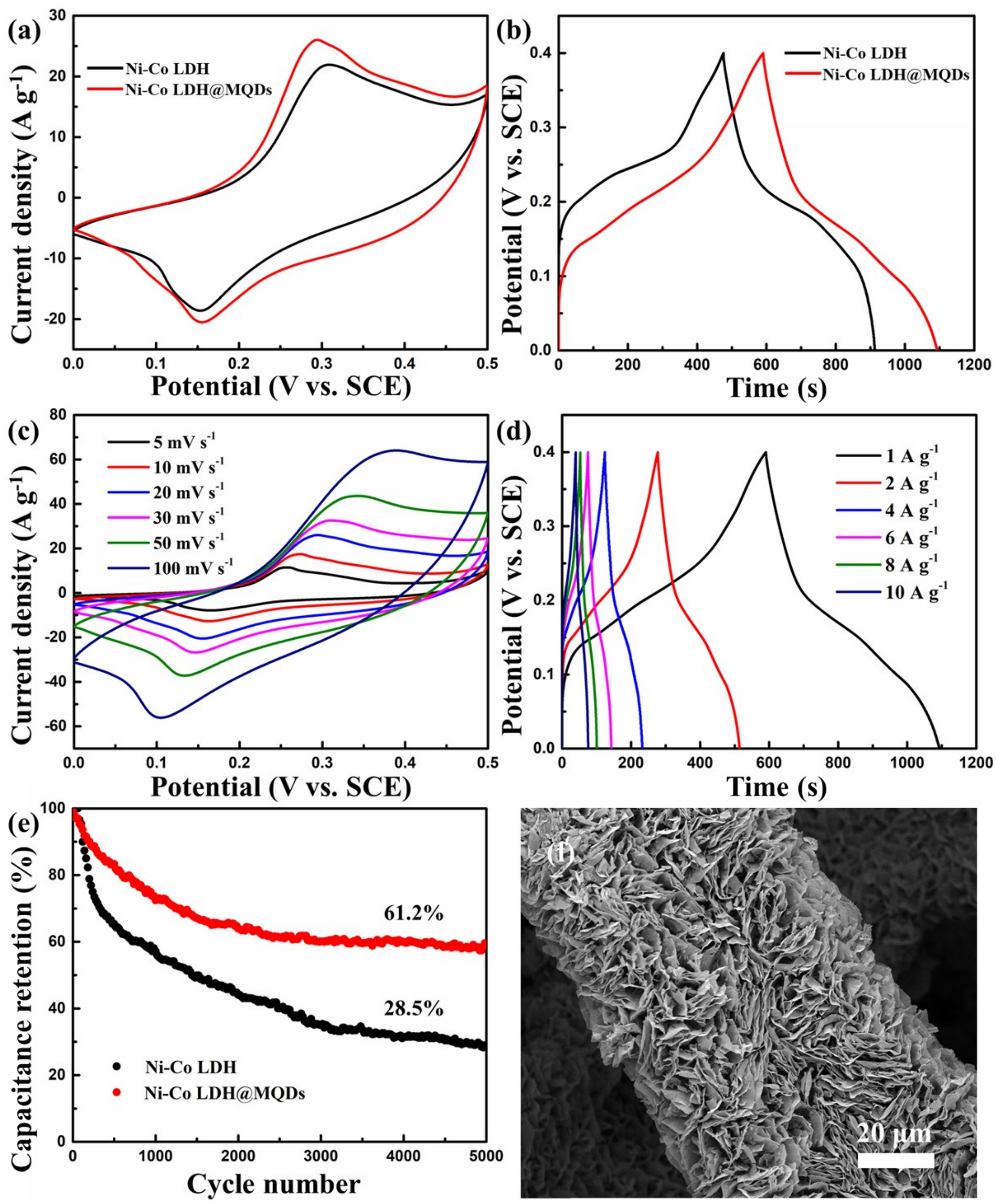

Fig. S8. (a) CV curves at a scan rate of 20 mV s^{-1}. (b) GCD profiles at a current density of 1 A g^{-1}. (c) CV curves at different scan rates and (d) GCD profiles at different current densities of Ni-Co LDH@MQDs. (e) Cyclic performance of Ni-Co LDH and Ni-Co LDH@MQDs at a current density 6 A g^{-1}. (f) SEM image of Ni-Co LDH@MQDs after 5000 cycles at 6 A g^{-1}.

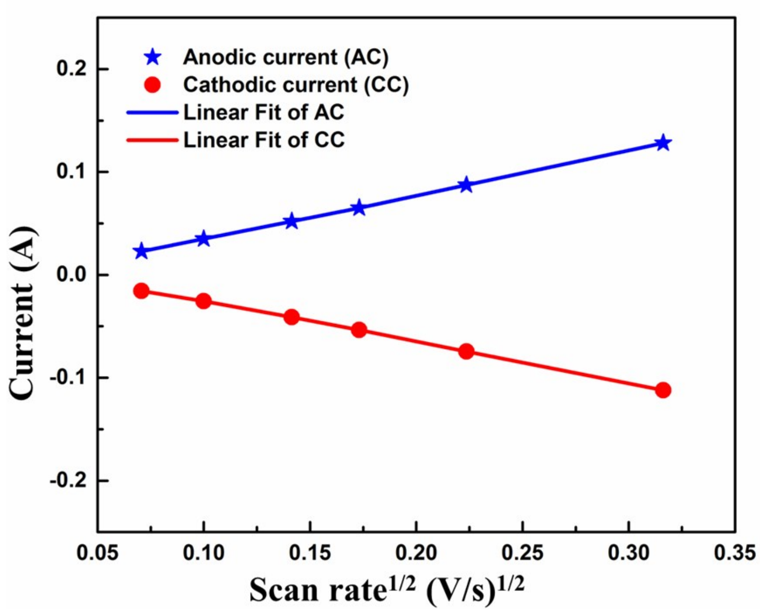

Fig. S9. The variation of cathodic/anodic peak currents for the Ni-Co LDH@MQDs as a function of the square root of scan rates.

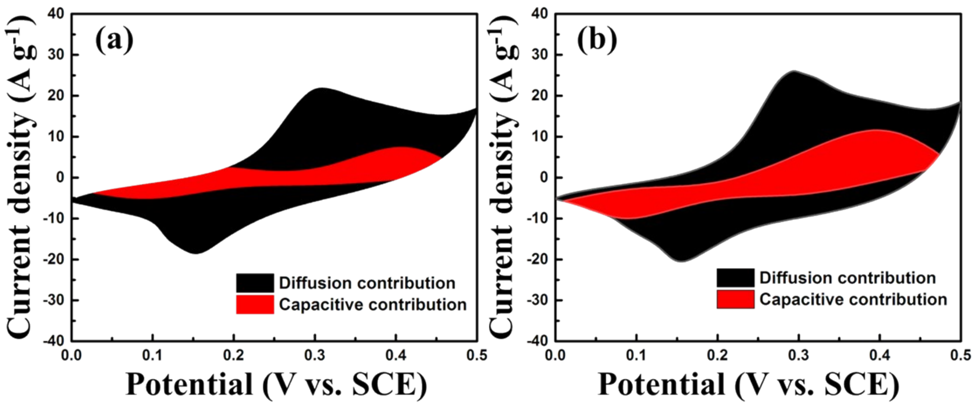

Fig. S10. (a, b) Capacitive and diffusion-controlled contributions of Ni-Co LDH and Ni-Co LDH@MQDs at 20 mV s^{-1}.

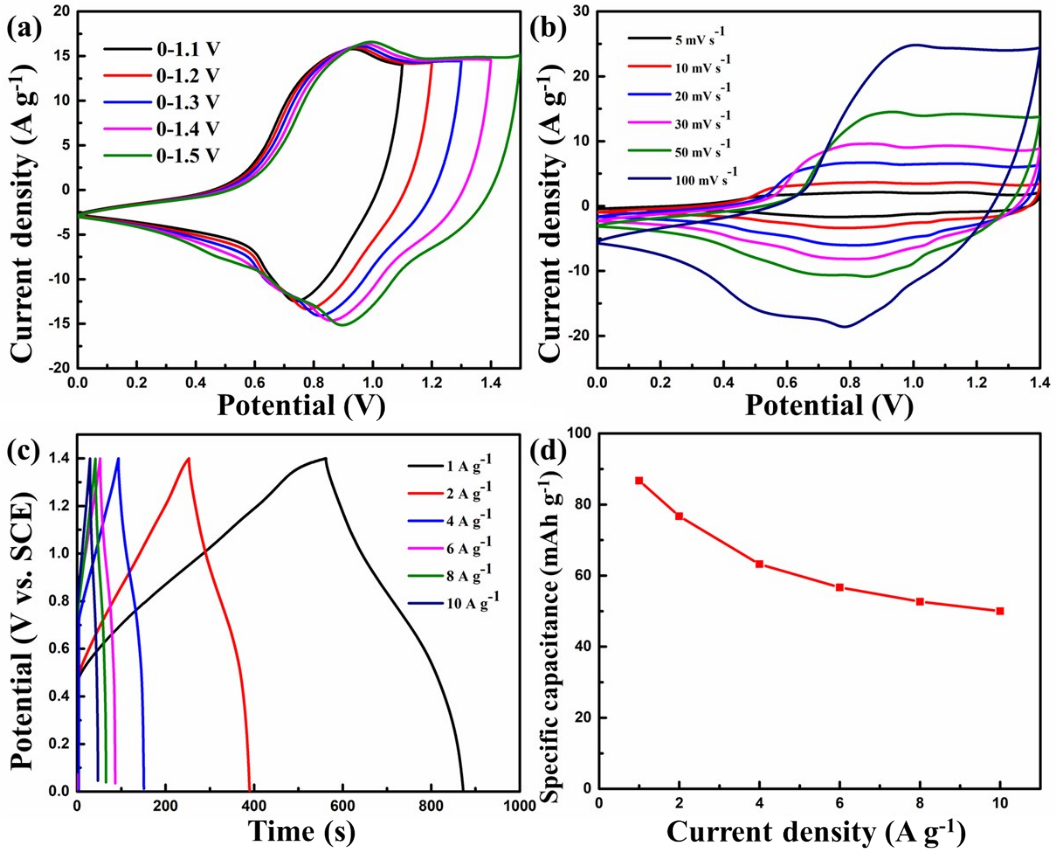

Fig. S11. (a) CV curves of Ni-Co LDH@MQDs//AC in different scan voltage windows at scan rate of 50 mV s^{-1}. (b) CV curves of Ni-Co LDH@MQDs//AC at different scan rates. (c) GCD profiles and (d) Capacitors of Ni-Co LDH@MQDs//AC at different current densities.

Table S1. The simulated EIS data.

Samples	R_s (Ohm/cm^2)	R_{ct} (Ohm/cm^2)	C (mF/cm^2)	W ($s^{1/2}$/cm^2)
Ni-CoLDH	1.04	2.54	1.97	0.0193
Ni-CoLDH @ MQDs	0.76	1.52	2.75	0.0214

Table S2. Comparison of energy density vs power density of reported supercapacitors.

Electrode	Energy density (W h kg^{-1})	Power density (W kg^{-1})	Ref.
Co_9S_8/NS-C//AC	14.8	681	Ref. 1
$CuCo_2S_4$//AC	46.1	992	Ref. 2
$FeCo_2$O4@MnO_2//AC	22.2	978	Ref. 3
$Co_{0.85}$Se//AC	39.0	789	Ref. 4
Ni_3S_2@d-Ti_3C_2//AC	23.6	4004	Ref. 5
MnO_2//AC	32.8	178	Ref. 6
Co/Cu-MOF/Cu_{2+1}O//AC	25.7	740.4	Ref. 7
$CoFe_2O_4$//AC	22.9	900	Ref. 8
$Ni(OH)_2$@AC@CNT//AC	32.3	505	Ref. 9
Ni-Co LDH@MQDs//AC	60.7	698	This work

Table S3. Comparison of the cycling stability of other reported devices.

Devices	Current density	Cycle performance	Ref.
Ni-Co LDH@MQDs//AC	6 A g^{-1}	98.6 after 10000 cycles	This work
ZnNi-CoP/NF//PPD-rGOs	10 A g^{-1}	89% after 8000 cycles	Ref. 10
NiO/Co_3O_4@NF//AC	5 A g^{-1}	82.5% after 12000 cycles	Ref. 11
$NiCo_2O_4$/NF//AC	1 A g^{-1}	81.1% after 5000 cycles	Ref. 12
CF@NiCoZnLDH/Co_9S_8-QD//CNS-SCN	3 A g^{-1}	95.3% after 8000 cycles	Ref. 13
NiCoP/Ni-CoOH//PC	2 A g^{-1}	92% after 1000 cycles	Ref. 14
L–$Ni(OH)_2$@PPy//G–30PPPy	3 A g^{-1}	91.5% after 6000 cycles	Ref. 15
NCLP@NiMn-LDH//AC	10 A g^{-1}	80% after 10000 cycles	Ref. 16
KCu_7S_4@NiMn LDH//AG	2.5 A g^{-1}	84.8% after 16000 cycles	Ref. 17
MnNi-CoCH/CF//AC	5 A g^{-1}	83.86% after 8000 cycles	Ref. 18
(Ni,Co)Se_2/Ni-CoLDH//PC	5 A g^{-1}	90% after 3000 cycles	Ref. 19
$NiCo_2S_4$//AC	10 A g^{-1}	92.0% after 10000 cycles	Ref. 20
P-Co_3O_4@P, N-C//Co@P, N-C	15 A g^{-1}	92.9% after 5000 cycles	Ref. 21
Ni-Co LDH//RGO	5 A g^{-1}	82% after 5000 cycles	Ref. 22
$NiCo_2Al$-LDH//CC@ZPC	5 A g^{-1}	91.2% after 15000 cycles	Ref. 23
HU-$CuCo_2S_4$//AC	10 A g^{-1}	85.0% after 10000 cycles	Ref. 24

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