Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

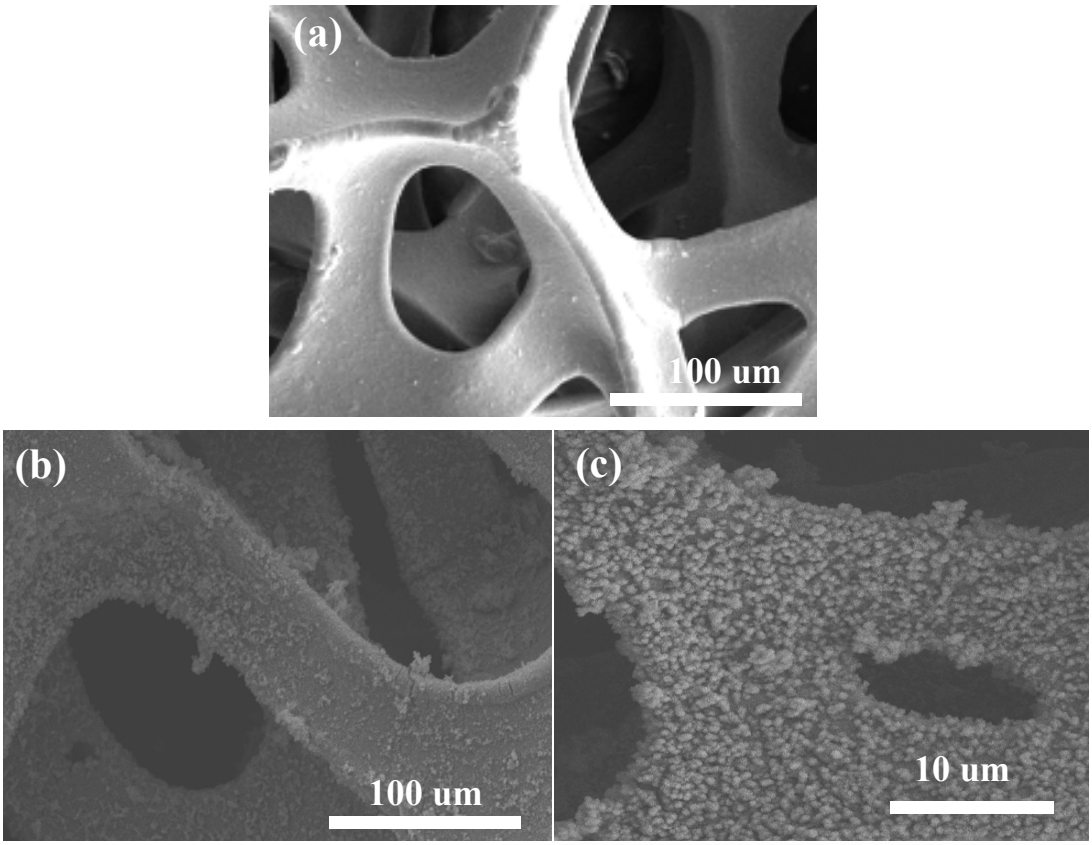

Figure S1. SEM images of (a) nickel foam; (b, c) SEM image of 0.8% Nd-$CoMoO_4$@$NiMoO_4$ under different magnification on nickel foam.

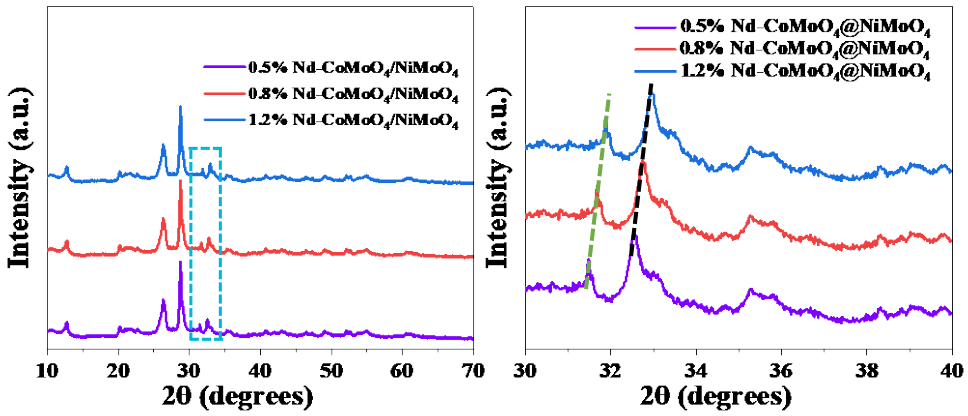

Figure S2. (a) XRD patterns of XRD of different Nd content in products; (b) corresponding amplified patterns of the diffraction peak around 32°.

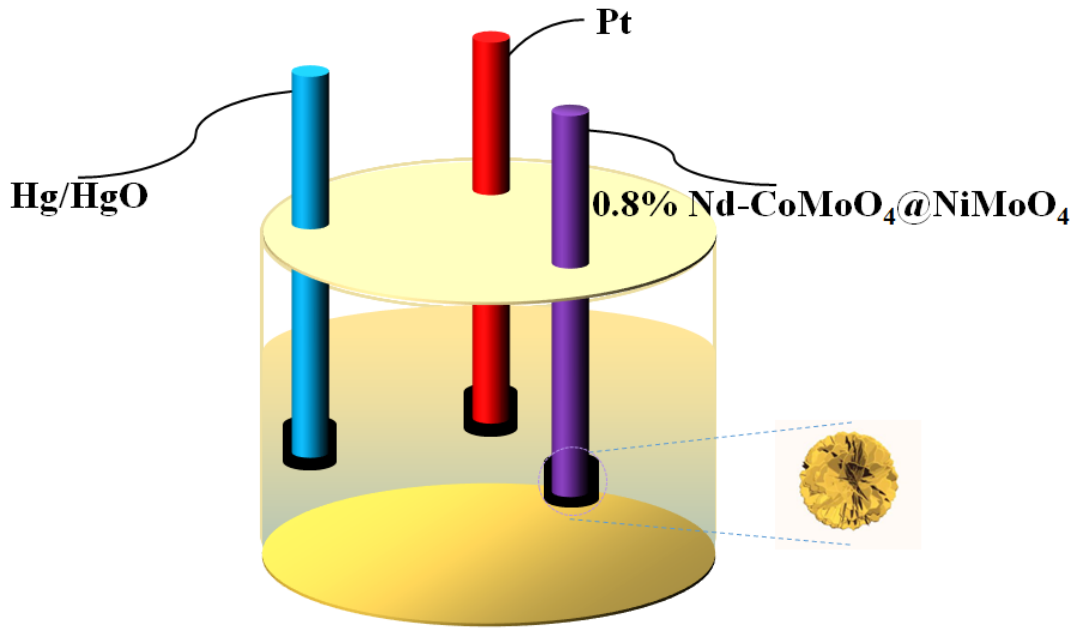

Figure S3. Schematic diagram of three-electrode test using 0.8% Nd-CoMoO4@NiMoO4 as working electrode.

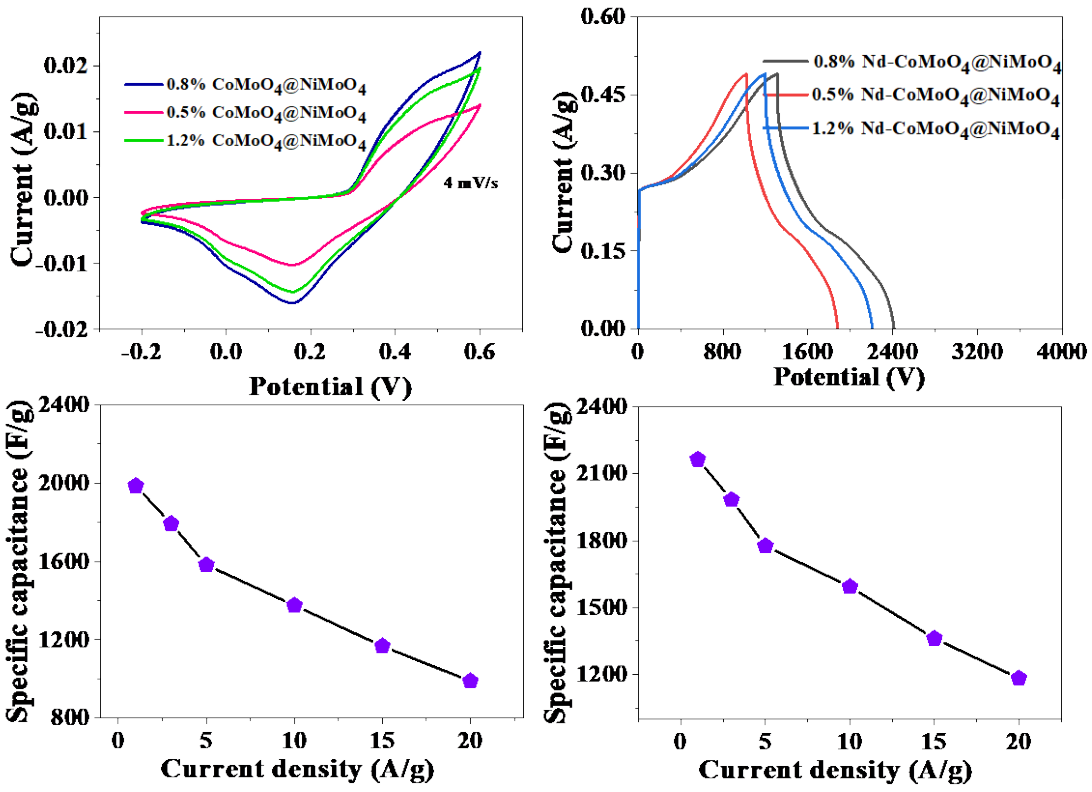

Figure S4. (a) CV curves of the 0.5% Nd-CoMoO4@NiMoO4, 0.8% Nd-CoMoO4@NiMoO4 and 1.2% Nd-CoMoO4@NiMoO4 at a scan rate of 4 mV/s; (b) Charge and discharge of the 0.5% Nd-CoMoO4@NiMoO4, 0.8% Nd-CoMoO4@NiMoO4 and 1.2% Nd-CoMoO4@NiMoO4; (c) Plot of the current

density against the specific capacitance of 0.5% Nd-$CoMoO_4$@$NiMoO_4$; (d) Plot of the current density against the specific capacitance of 1.2% Nd-$CoMoO_4$@$NiMoO_4$.

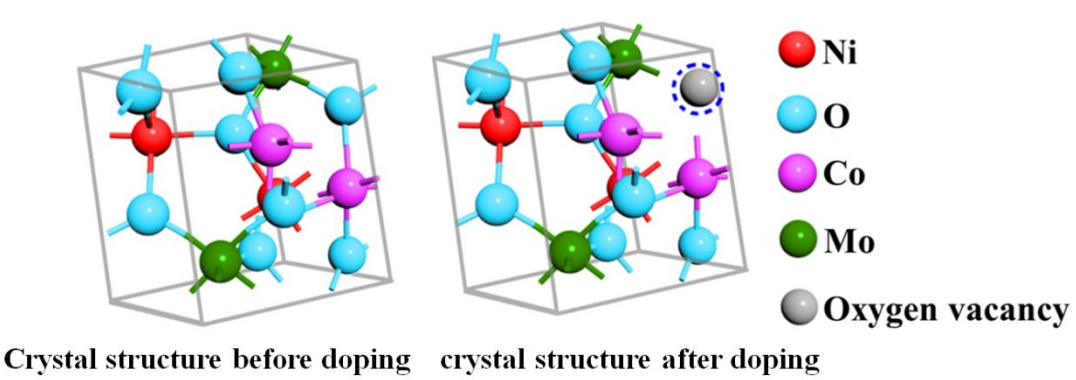

Figure S5. Crystal structure of rare earth element Nd before and after doping.

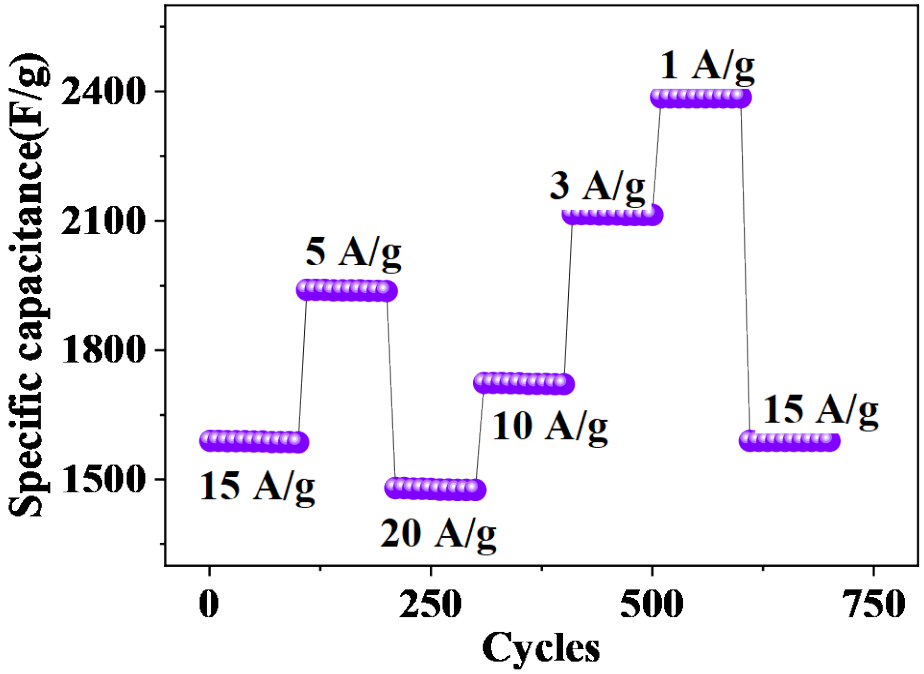

Figure S6. Rate and cycle performance of 0.8% Nd-$CoMoO_4$@$NiMoO_4$ under different current densities.

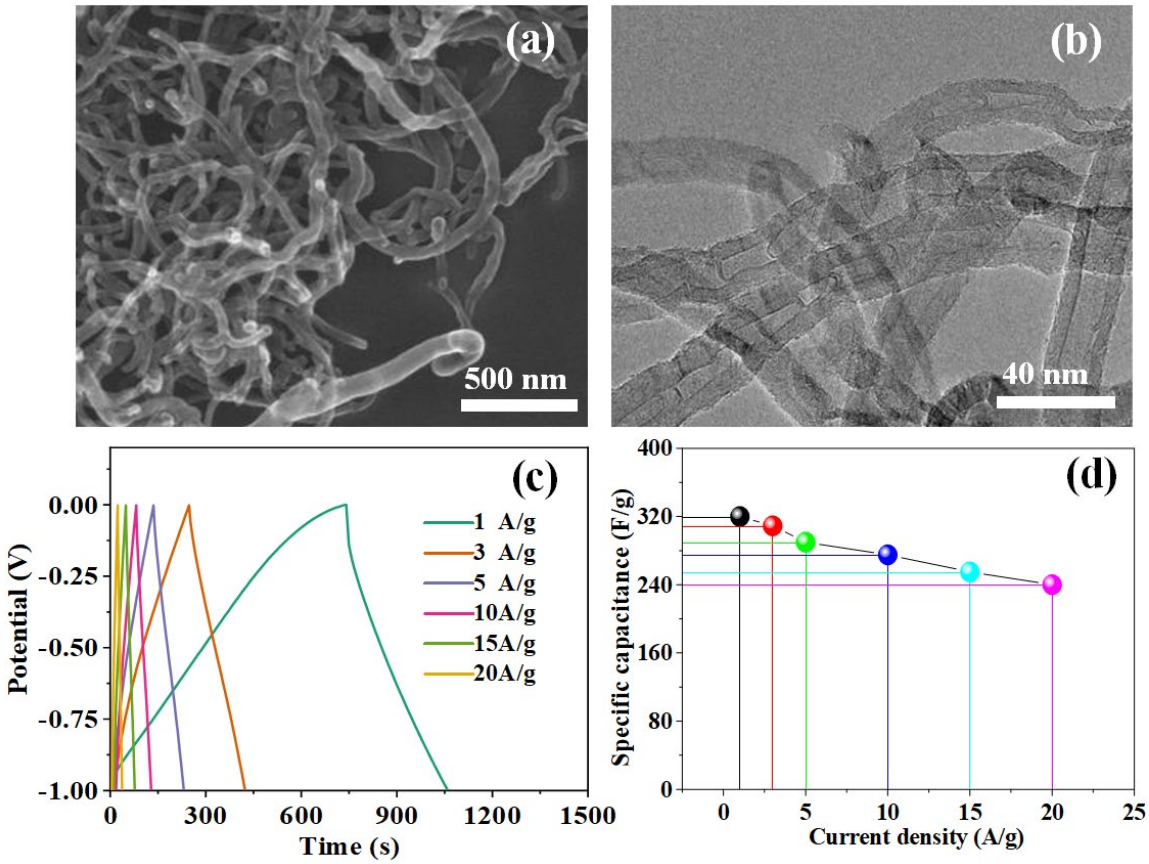

Figure S7. (a) SEM images of CNTs; (b) TEM image of CNTs; (c) charge and discharge of CNTs at different current densities; (d) Plot of the current density against the specific capacitance of CNTs.

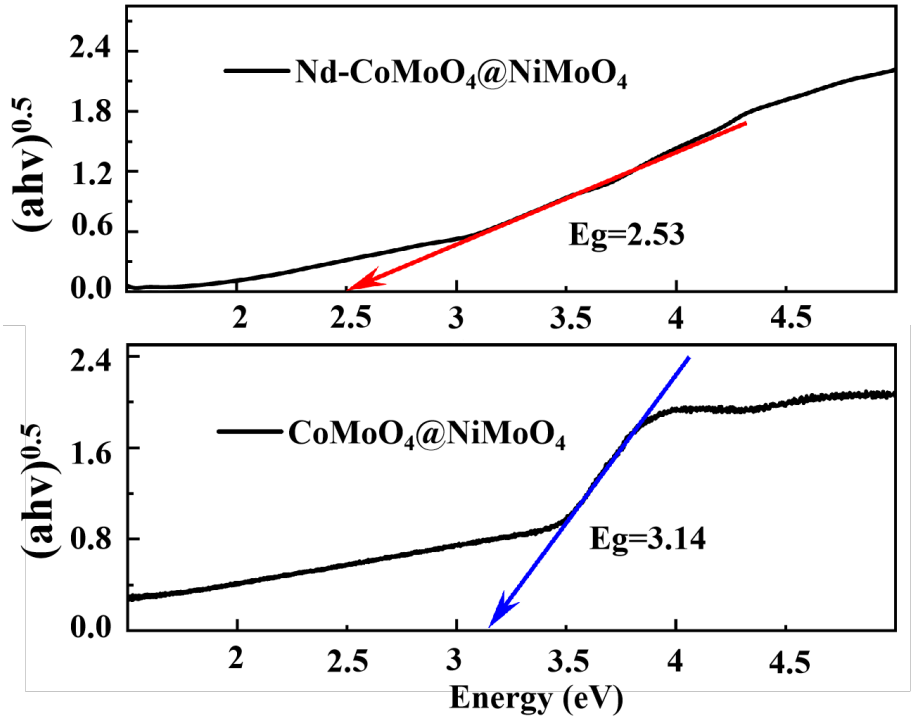

Figure S8. UV-Vis DRS images of 0.8% Nd-$CoMoO_4$@$NiMoO_4$ and $CoMoO_4$@$NiMoO_4$.

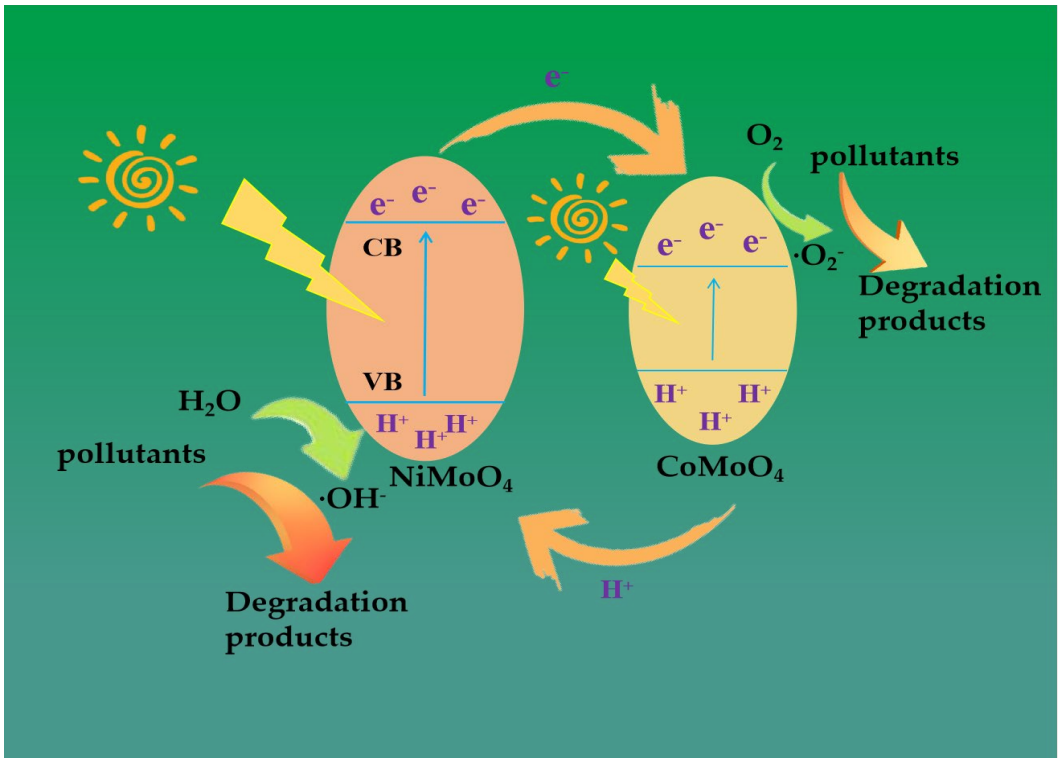

Figure S9. Photocatalytic mechanism diagram.

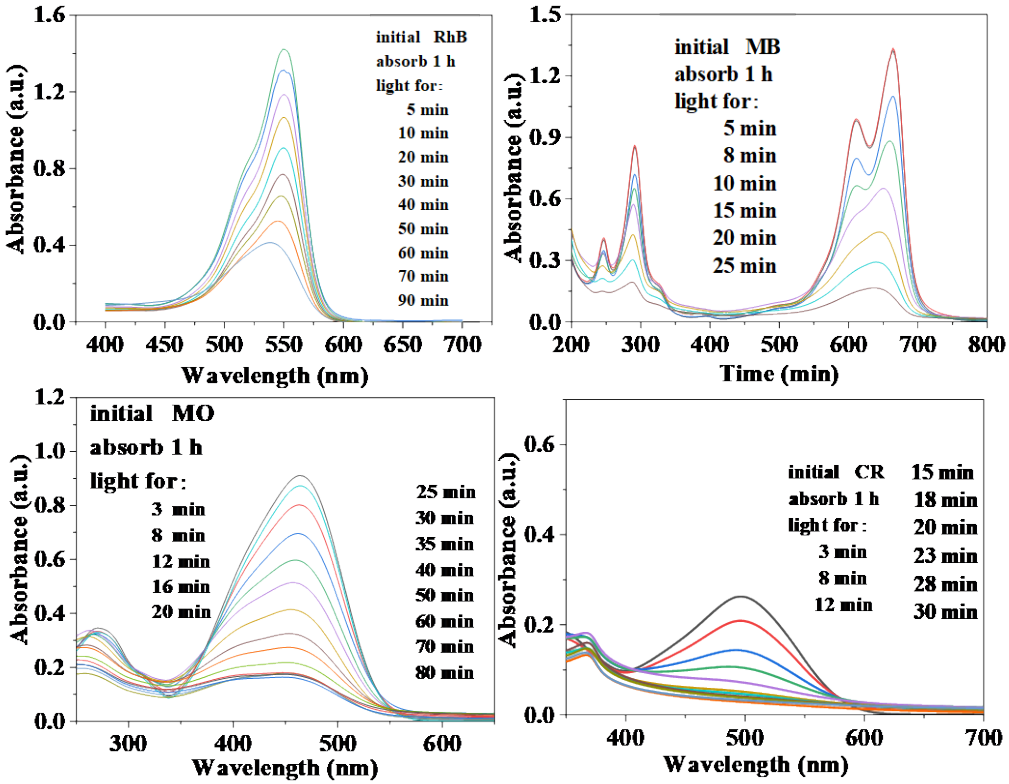

Figure S10. UV absorption spectra for (a) RhB; (b) MB; (c) MO and (d) CR aqueous solution during photodegradation with $CoMoO_4$@$NiMoO_4$.

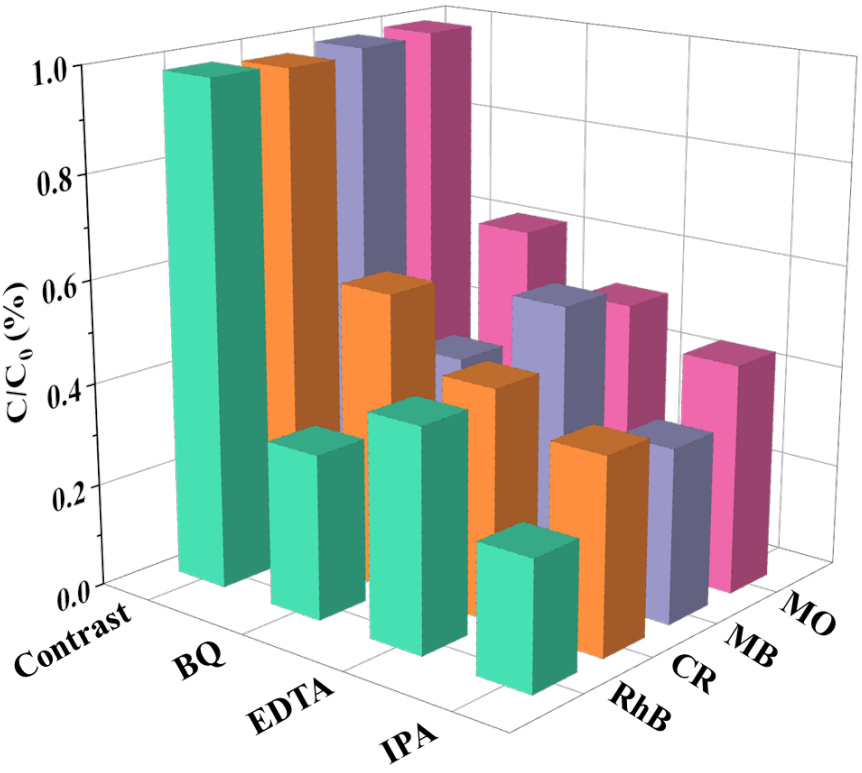

Figure S11. Degradation rate of RhB, CR, MB and MO to different masking agents.

Table S1 Electrochemical performance comparison of the Devices

The device name	Current density	specific capacitance	Cycle stability	Ref
β-$CoMoO_4$//AC	1 A/g	27.7 F/g	92%(8000)	[68]
$NiMoO_4$//AC	1 A/g	151.7 F/g	97.7%(2000)	[69]
$NiMoO_4$//AC	1 mA cm^{-2}	156.25 F/g	83.6%(6000)	[70]
$MnCo_2O_4$@$NiMoO_4$//AC	1 A/g	118.27 F g	93%(8000)	[71]
$NiMoO_4$-$CoMoO_4$//G-ink	1 A/g	104.1 F/g	95.88%(5000)	[72]
$CoMoO_4$+$NiMoO_4$//CNTs)	1 A/g	142 F/g	97.7%(10 000)	[73]
$MnMoO_4$@CNF//AC	0.2	102.56 F/g	92.1%(5000)	[74]
$CoMoO_4$@$NiCo_2S_4$//AC	5 mA cm^{-2}	182 F/g	84%(5000)	[75]
0.8% Nd-$CoMoO_4$@$NiMoO_4$//CNTs	1 A/g	262 F/g	99.2%(3000)	This paper

Table S2 Degradation efficiency of dyes by materials

Materials	dye	degradation time	degradation rate	Catalyst dose	Dye conc. vol. (mL)	Cyclic stability	Ref
g-C_3N_4/TiO_2/α-Fe_2O_3	RhB	50 min	95.7%	50 mg	50 mg/L (100 mL)	>92% (5)	[83]
Ag_2O/g-C_3N_4/TiO_2	RhB	60 min	94.5%	50 mg	50 mg/L (100 mL)	Nearly 93% (5)	[84]
0.8% Nd-$CoMoO_4$@$NiMoO_4$	RhB	90 min	97.2%	40 mg	50 mg/L (100 mL)	96% (50)	This paper
ZnO	CR	5 h	> 95%	30 mg	20 mg/L (10 mL)	Nearly 84% (3)	[85]
Ag-MgO	CR	120 min	80%	10 mg	10 mg/L (100 mL)		[86]
0.8% Nd-$CoMoO_4$@$NiMoO_4$	CR	30 min	96.4%	40 mg	50 mg/L (100 mL)	98.5% (50)	This paper

$ZnCo_2O_4$	MB	40 min	98.8%		40 mg/L (200 mL)	98.5% (15)	[87]
ZnO–SnO_2	MB	60 min	96.53%	0.2 g	20 mg/L (10 mL)	over 85%	[88]
0.8% Nd-$CoMoO_4$@$NiMoO_4$	MB	25 min	98.6%	40 mg	50 mg/L (100 mL)	98% (50)	This paper
TiO_2@Cd-MOF	MO	90 min	97.1%	10 mg	10 mg/L (10 mL)	85.1% (3)	[89]
Au-TiO_2	MO	20 min	94%	5 mg	250 mg/L (10 mL)		[90]
0.8% Nd-$CoMoO_4$@$NiMoO_4$	MO	80 min	99.3%	40 mg	50 mg/L (100 mL)	96.2% (50)	This paper

Table S3 Kinetic parameters of photocatalytic degradation of 0.8% Nd-$CoMoO_4$@$NiMoO_4$

dyes	*k* (min)	r^2
MO	3.98×10^{-3}	0.9986
RhB	3.14×10^{-3}	0.9958
CR	3.59×10^{-3}	0.9976
MB	3.79×10^{-3}	0.9982