

Supporting information for

**Nickel Nanoparticle/Carbon Quantum Dot hybrid as
Efficient Electrocatalyst for Hydrogen Evolution under
Alkaline Condition**

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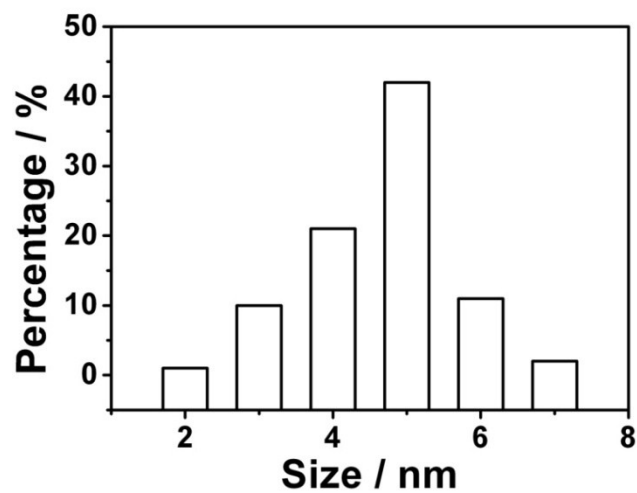


Figure S1 Size distribution histogram of CQDs.

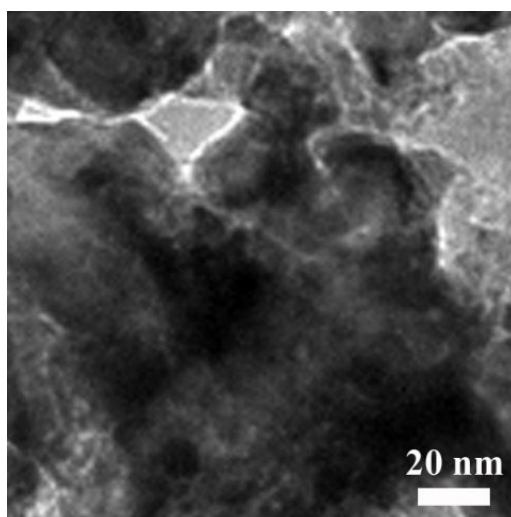


Figure S2 Typical TEM image of sample prepared from pyrolysis of physical mixture of $\text{Ni}(\text{OH})_2$ with CQDs.

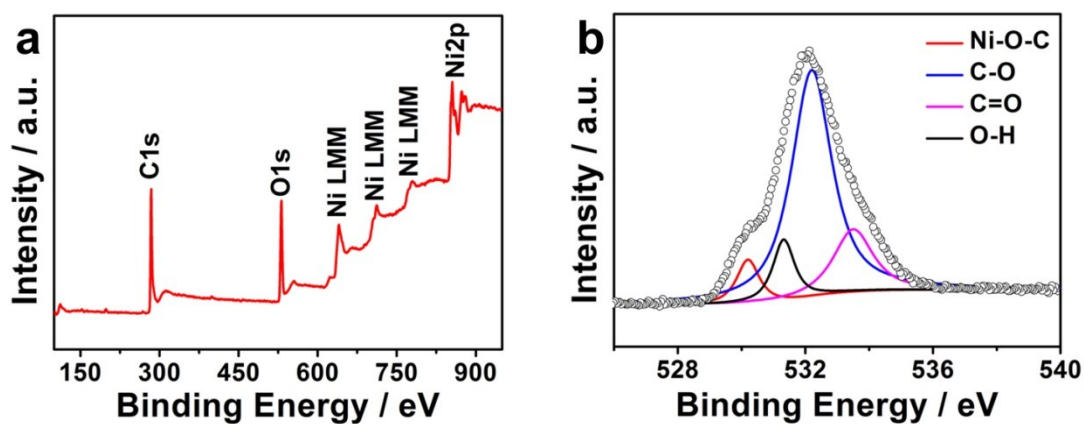


Figure S3 (a) Full XPS scan and (b) high resolution O1s XPS spectrum of Ni/CQDs.

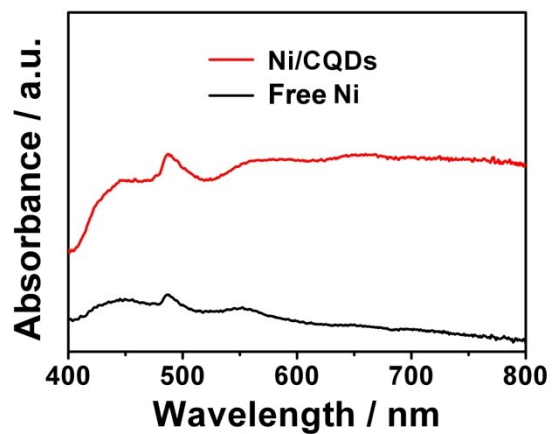


Figure S4 UV-vis absorption spectra of Ni/CQDs (the red trace) and free Ni (the black trace) catalysts.

Table S1 The exchange current density of Ni/CQDs, free Ni, and CQDs.

Samples	CQDs	Free Ni	Ni/CQDs
$j_0 / \text{mA} \cdot \text{cm}^{-2}$	0.0006	0.0262	0.4467

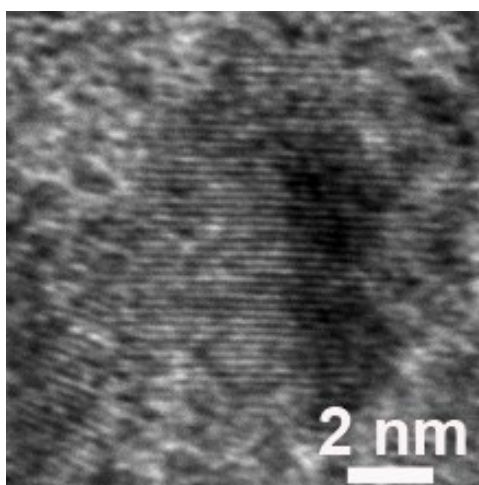


Figure S5 HRTEM image of Ni/CQDs after 1000 cycle's reaction.

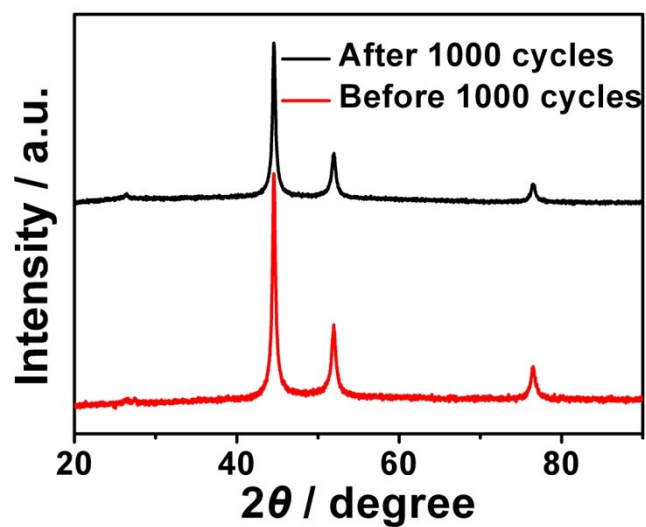


Figure S6 XRD spectra of Ni/CQDs before and after 1000 cycle's reaction.

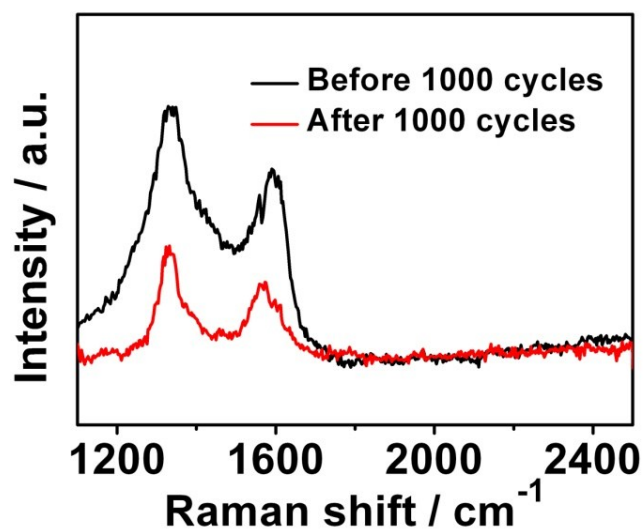


Figure S7 Raman spectra of Ni/CQDs before and after 1000 cycle's reaction.

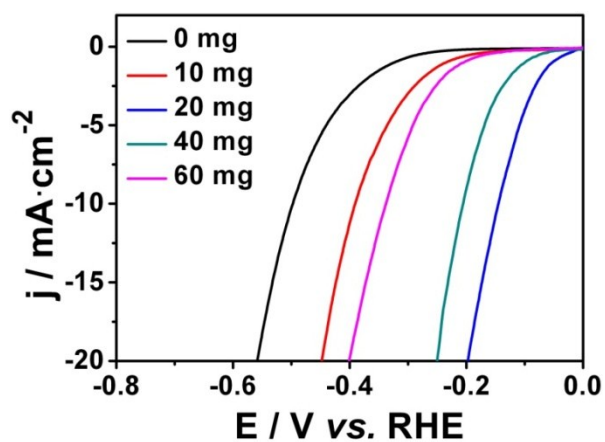


Figure S8 Polarization curves of HER on Ni/CQDs with various CQDs amounts: 0 mg, 10 mg, 20 mg, 40 mg, and 60 mg.

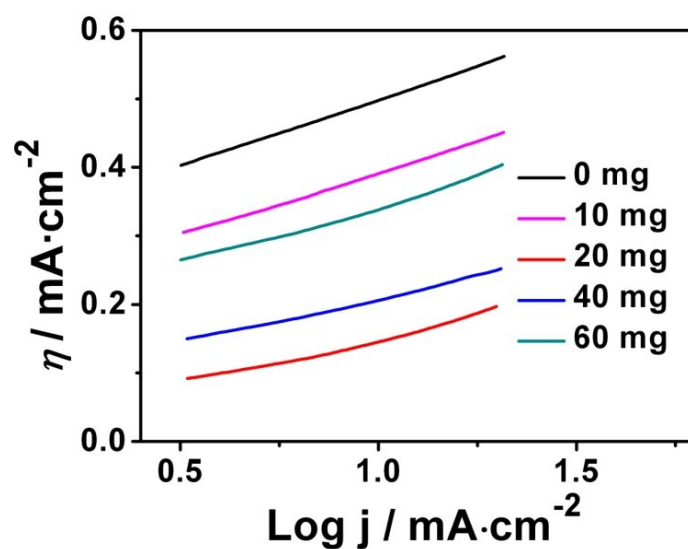


Figure S9 Tafel plots for the HER on Ni/CQDs with various CQDs amounts: 0 mg, 10 mg, 20 mg, 40 mg, and 60 mg.

Table S2 The exchange current density of Ni/CQDs prepared with various CQDs amounts.^a

CQDs amount / mg	0	10	20	40	60
$j_0 / \text{mA}\cdot\text{cm}^{-2}$	0.0262	0.0711	0.4467	0.1570	0.0556

^aAll samples were prepared by pyrolysis at 500 °C.

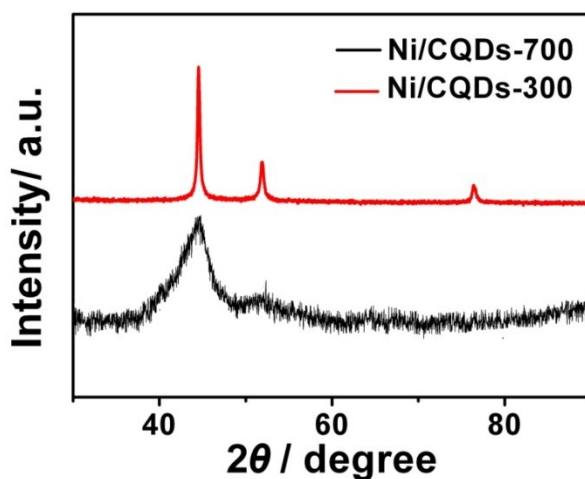


Figure S10 XRD spectra of Ni/CQDs-300 and Ni/CQDs-700.

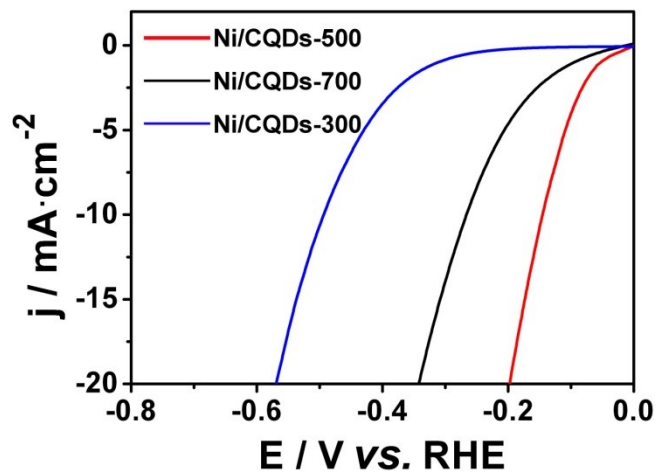


Figure S11 Polarization curves of HER on Ni/CQDs-300, Ni/CQDs-500, and Ni/CQDs-700.

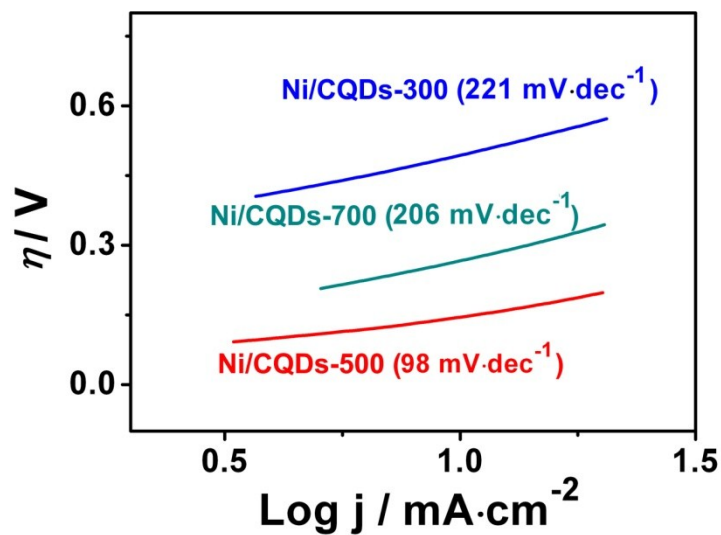


Figure S12 Tafel plots for the HER on Ni/CQDs-300, Ni/CQDs-500, and Ni/CQDs-700.

Table S3 The exchange current density of Ni/CQDs prepared at various temperatures.^a

Temperature / °C	300	500	700
$j_0 / \text{mA}\cdot\text{cm}^{-2}$	0.0711	0.4467	0.3858

^aAll samples were prepared from 20 mg CQDs.

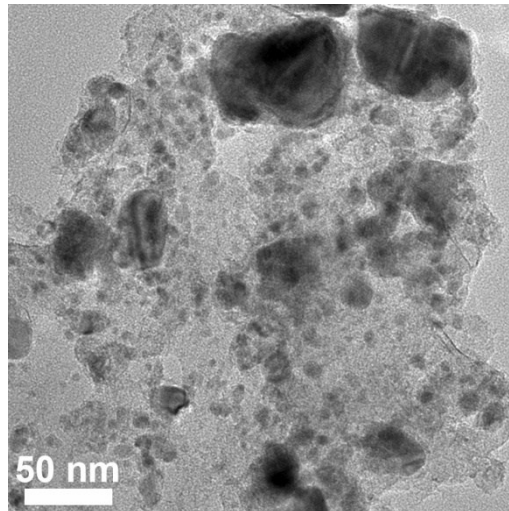


Figure S13 Typical TEM image of Ni/CQDs-700.

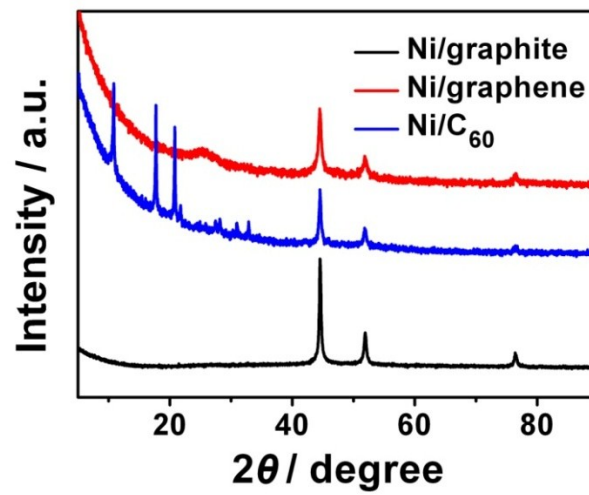


Figure S14 XRD spectra of Ni/C₆₀, Ni/grapheme, and Ni/graphite.

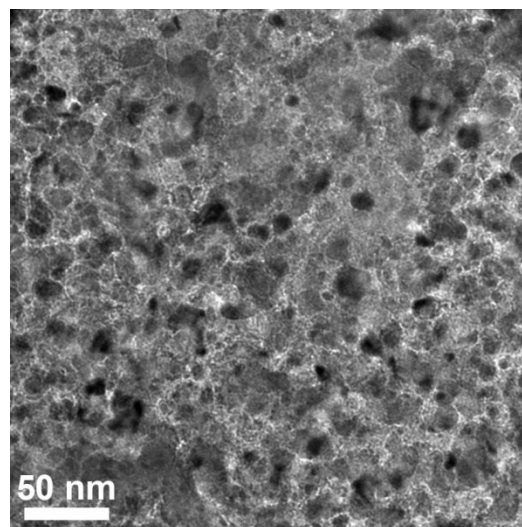


Figure S15 Typical TEM images of Ni/C₆₀, which was prepared from 20 mg C₆₀.

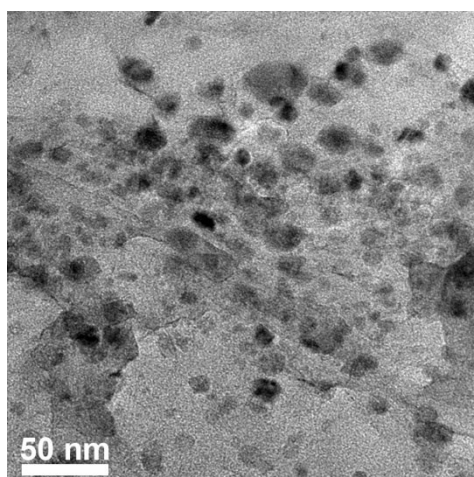


Figure S16 Typical TEM images of Ni/graphene, which was prepared from 20 mg graphene.

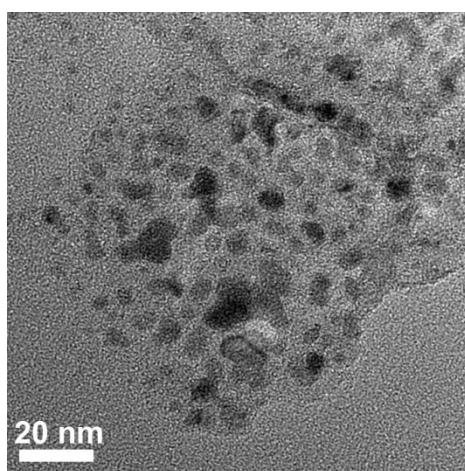


Figure S17 Typical TEM images of Ni/graphite, which was prepared from 20 mg graphite.

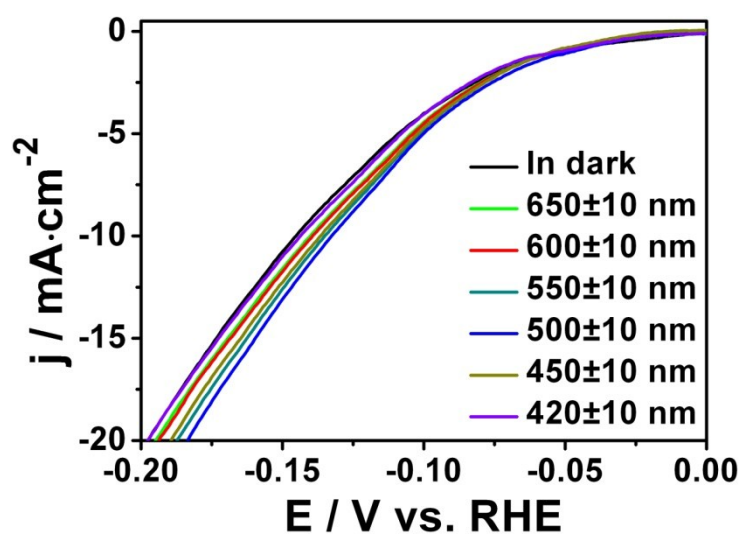


Figure S18 Polarization curves of HER on Ni/CQDs modified electrode illuminated under various wavelengths.