Supplementary Materials: The Effects of CeO_2 Nanorods and CeO_2 Nanoflakes on Ni–S Alloys in Hydrogen Evolution Reactions in Alkaline Solutions

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In supergravity field, there is a corresponding acceleration at a certain speed. The acceleration can be calculated by the following formula [1]:

$$a = r\omega^2 = r\left(\frac{2\pi N}{60}\right)^2 = \frac{N^2\pi^2 r}{900} \quad (1)$$

where a is acceleration (m/s^2) of the surpergravity filed, ω is angular speed (rad/s), N is speed (rpm), r is the distance from cathode to axis (5 cm).

When N is equal to 3000 rpm, the value of a is 4,929.8 m/s^2, which is 503.04 times than that of acceleration of gravity, i.e. the field can be called supergravity field.

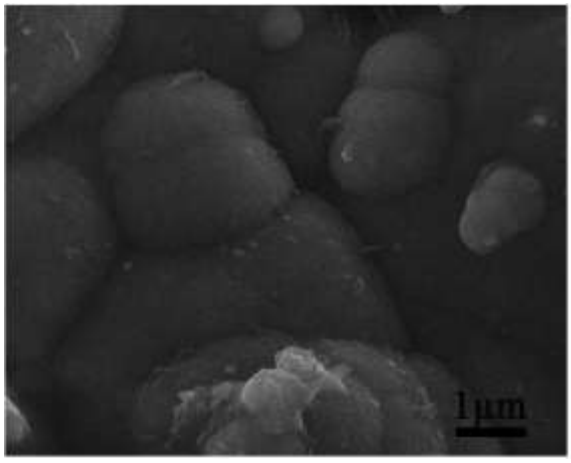

Figure S1. SEM image of M-0.

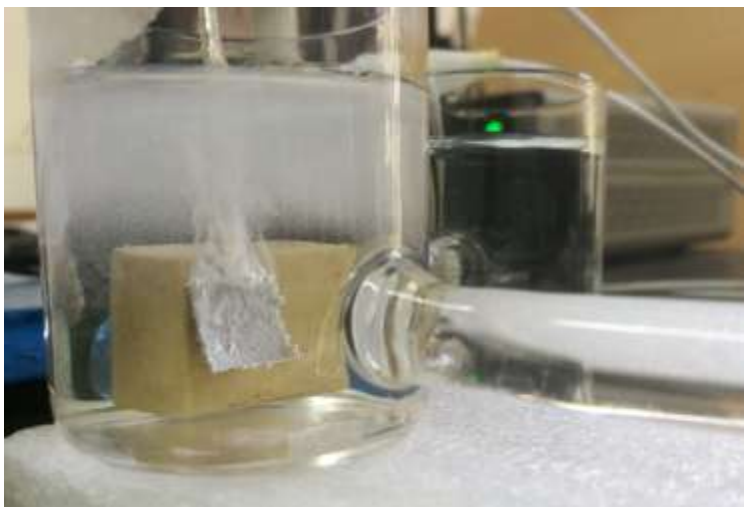

Figure S2. Image showing hydrogen evolution with the M-CeO_2(Nr).

Table S1. **Comparison of HER performance in alkaline media for Ni-S/CeO_2(Nr) and Ni-S/CeO_2(Nf) with other non-noble-metal HER electrocatalysts.**

Catalyst	*b*/mV dec^{-1}	j_0/mA cm^{-2}	Test temperature	Solution	Ref.
Ni-CeO_2	146.6	0.338	298K	1 M NaOH	[2]
Ni-Zn/CeO_2	146	5.37	298K	1 M NaOH	[3]
Ni-S(La)	63.8	5.6	298K	28% NaOH	[4]
Ni-S/CeO_2(Nr)	163	7.40	298K	1 M NaOH	This work
Ni-S/CeO_2(Nf)	158	7.48	298K	1 M NaOH	This work

Table S2. Values of the charge transfer resistance and the mass transfer resistance of four different electrodes.

Paramater	M-0	M-CeO_2 Nr	M-CeO_2 Nf
R_{ct} (Ω)	14.55	2.81	2.46

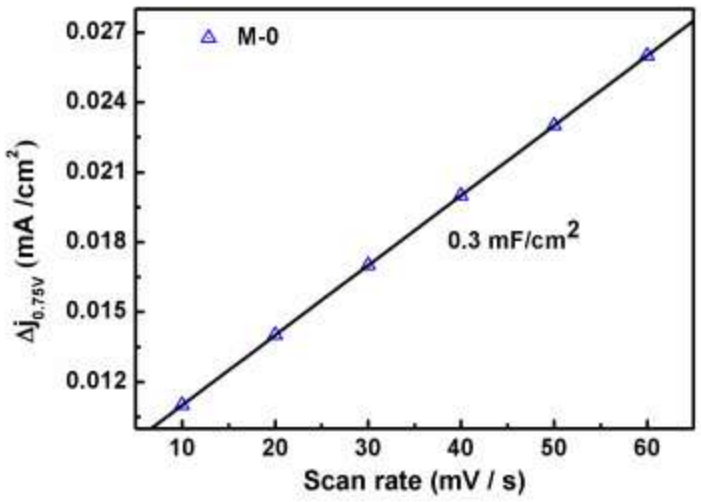

Figure S3. Liner fitting of the capacitive current of M-0 vs. scan rates. The selected potential range where no faradic current was tested is 0.025V to 0.125V vs. RHE.

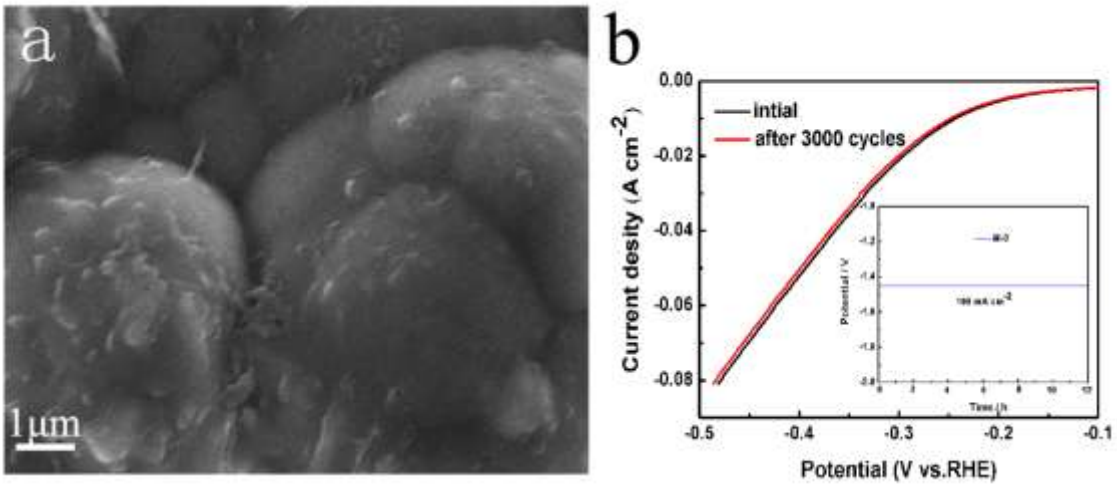

Figure S4. (**a**) SEM of M-0 after 3000 cycles; (**b**)LSV curves of M-0 before and after 3000 CV cycles at a scan rate of 100 mV S^{-1} between −0.825 to −1.025 V. Inset, time dependence of the potential of M-0 at a current density of 100 mA cm^{-2}.

References

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2. Chen, Z.; Shao, G.; Ma, Z.; Song, J.; Wang, G.; Huang, W. Preparation of Ni–CeO_2 composite coatings with high catalytic activity for hydrogen evolution reaction. *Mater. Lett.* **2015**, *160*, 34–37.
3. Chen, Z.; Ma, Z.; Song, J.; Wang, L.; Shao, G. A novel approach for the preparation of Ni–CeO_2 composite cathodes with enhanced electrocatalytic activity. *RSC Adv.* **2016**, *6*, 60806–60814
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