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High-frequency ultrasonic pyrolysis of 200 nm ultrafine Fe-doped NiO hollow spheres for efficient oxygen evolution catalysis

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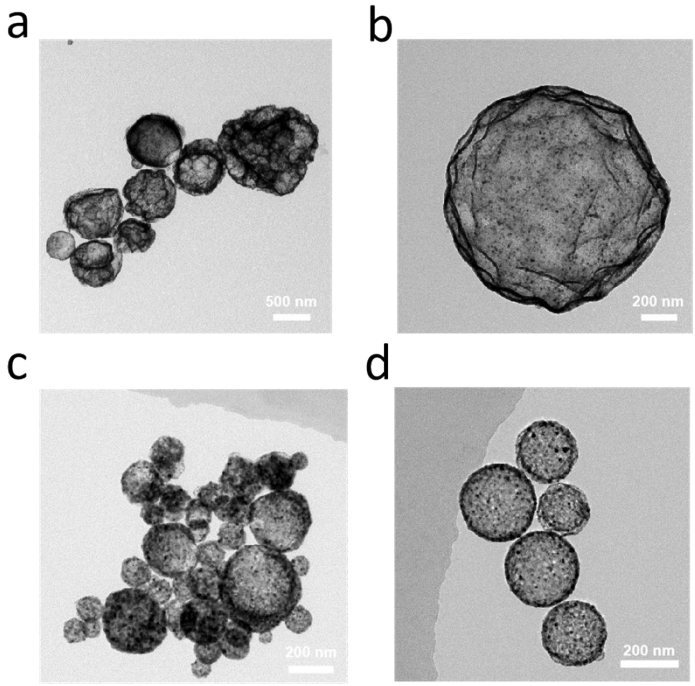
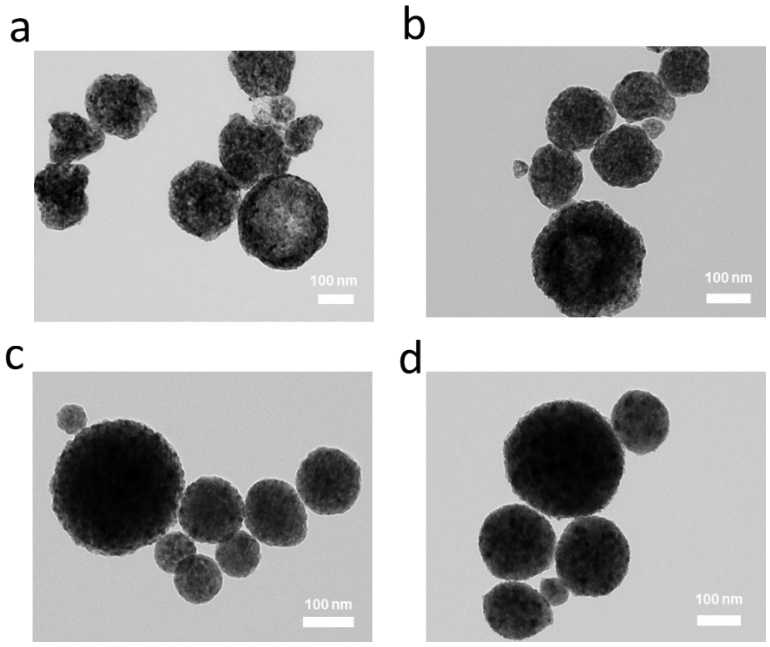
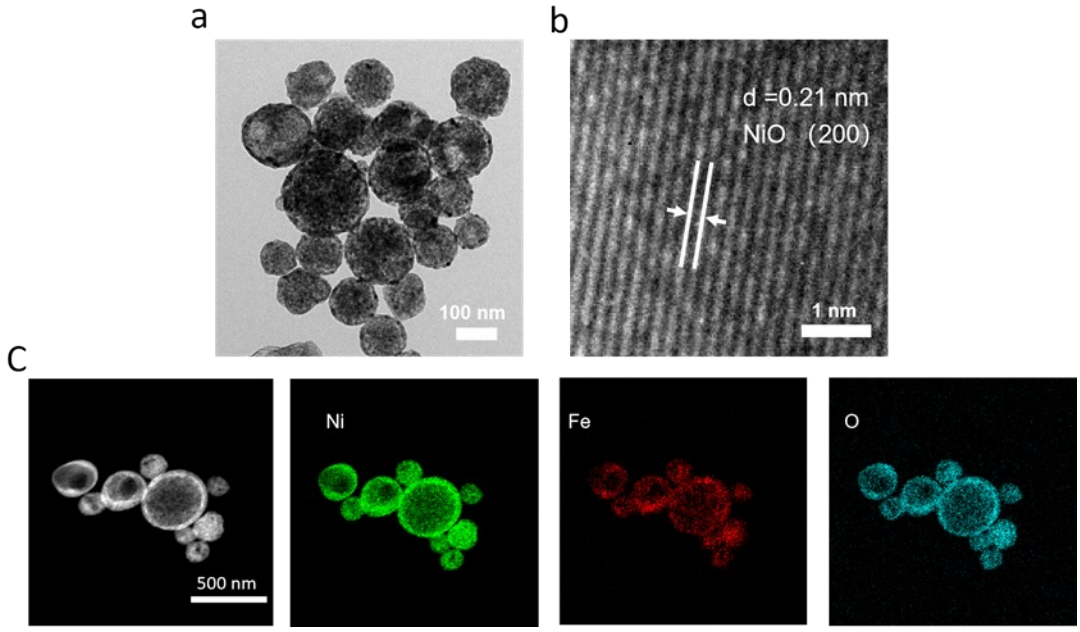


Supplementary Figure 1. (**a, b**) TEM images of NiO hollow nanospheres at 1.7 MHz frequency. **(c, d)** TEM images of NiO hollow nanospheres at 3.0 MHz frequency.



Supplementary Figure 2. TEM images of $Ni_{0.8}Fe_{0.2}O$, $Ni_{0.7}Fe_{0.3}O$, $Ni_{0.6}Fe_{0.4}O$ and $Ni_{0.5}Fe_{0.5}O$.



Supplementary Figure 3. (**a**) TEM image, (**b**) HRTEM image and (**c**) EDS mapping of $Ni_{0.9}Fe_{0.1}O$ hollow nanospheres after OER.

Supplementary Table 1. Comparisons of the η_{10} of $Ni_{0.9}Fe_{0.1}O$ hollow nanospheres with representative electrocatalysts reported previously.

Catalyst	Electrode substrate	Overpotential (mV)	Electrolyte	Reference
$Ni_{0.9}Fe_{0.1}O$ hollow nanospheres	Glassy carbon	288	1 M KOH	This work
Hollow cobalt nickel oxides microspheres	Glassy carbon	310	1 M KOH	1
Porous NiO hollow spheres	Glassy carbon	323	1 M KOH	2
Porous NiO nano flowers	Glassy carbon	346	1 M KOH	2
3D porous carbon@Ni/NiO	Glassy carbon	353	1 M KOH	3
Ni-Co mixed oxide nanocages	Glassy carbon	380	1 M KOH	4
Hollow $NiCo_2O_4$ arrays	Glassy carbon	340	1 M KOH	5
$CoNiO_2$/SNC	Glassy carbon	280	1 M KOH	6
CoNiOx/NC	Glassy carbon	335	1 M KOH	6
Multi-shelled $Co_{0.5}Ni_{0.5}$ oxide/phosphide	Glassy carbon	268	1 M KOH	7
Porous nanoscale $NiO/NiCo_2O_4$	Glassy carbon	264	1 M KOH	8
U-$NiO/NiCo_2O_4$	Glassy carbon	387	0.1M KOH	9
C-$NiO/NiCo_2O_4$	Glassy carbon	430	0.1M KOH	9
Multilayer hollow $MnCo_2O_4$ microsphere	Glassy carbon	400	0.1M KOH	10
3D $NiFe_2O_4$ hollow spheres	Glassy carbon	370	0.1M KOH	11

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