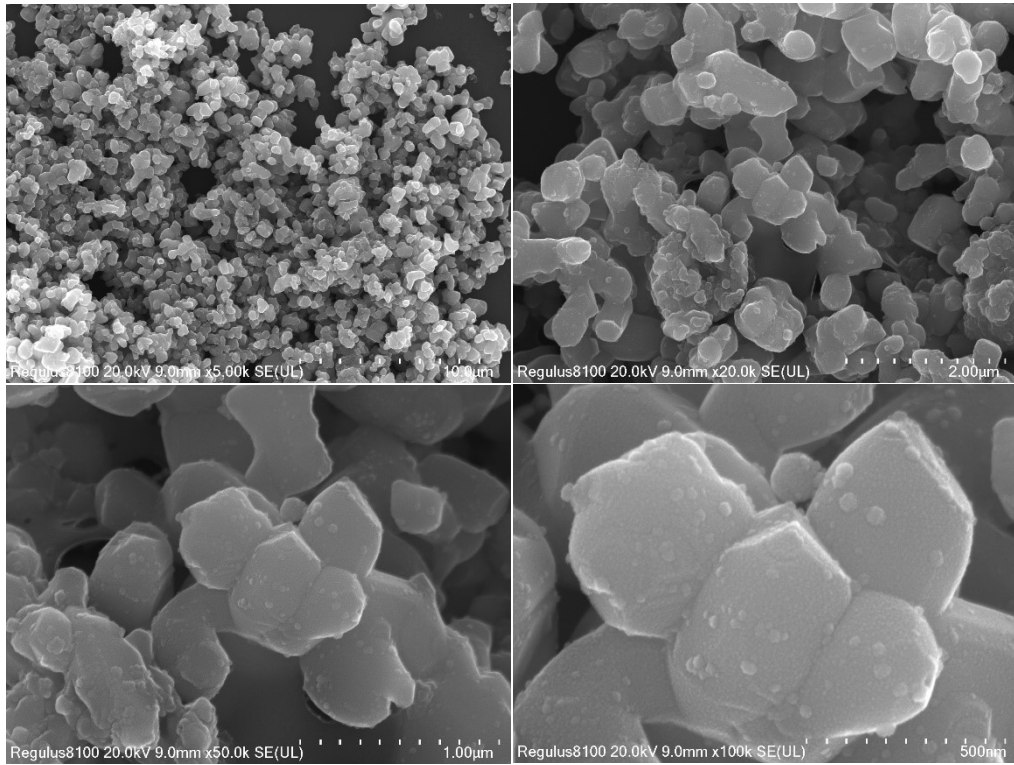


*Supporting information*

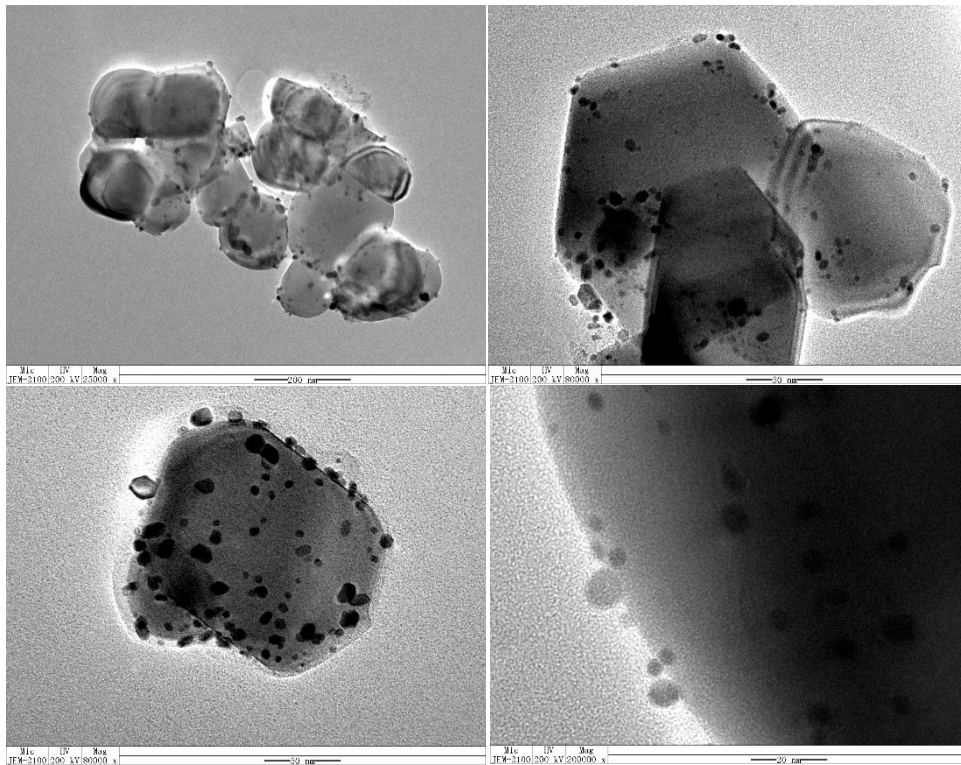
**Preparation of Carbon Coated Hyperdispersed Ru  
Nanoparticles Supported on TiO<sub>2</sub> HER Electrocatalysts by  
Dye-Sensitization**

Hong-Cheng Li, Peng-Cheng Ji, Yang Teng, Hai-Lang Jia,\* Ming-Yun Guan

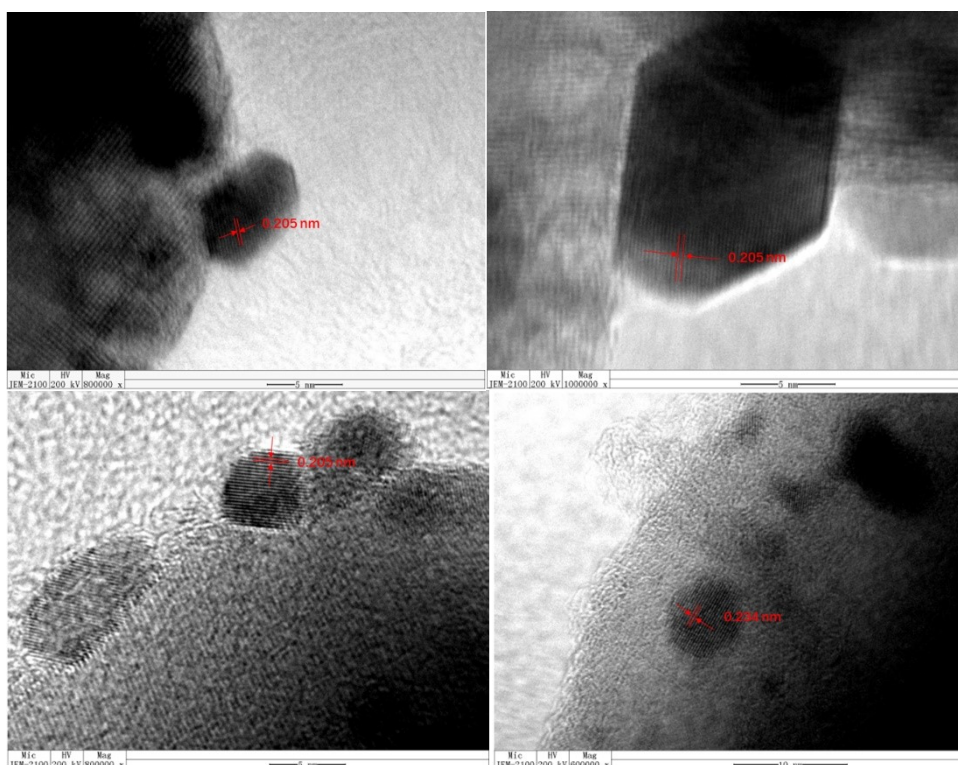
School of Chemistry and Chemical Engineering, Institute of Advanced Functional Materials for  
Energy, Analysis and Testing Center of Jiangsu University of Technology, Jiangsu University of  
Technology, Changzhou 213001, P. R. China.



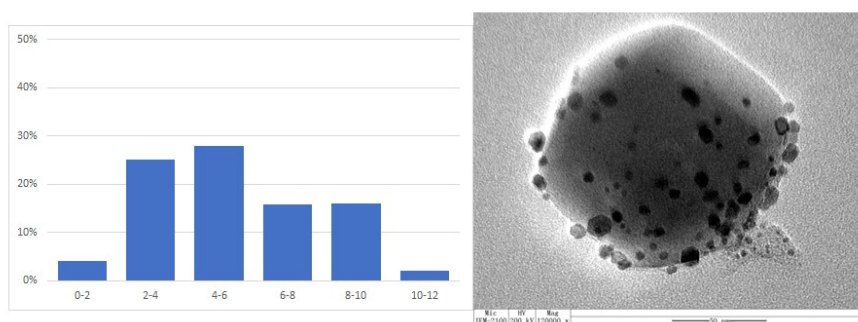
**Fig. S1** SEM of Ru/TiO<sub>2</sub>



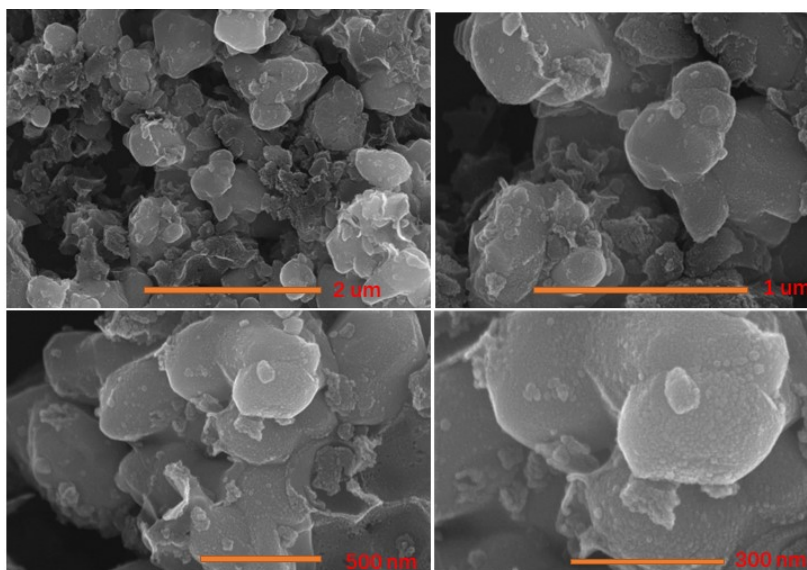
**Fig. S2** TEM of Ru/TiO<sub>2</sub>



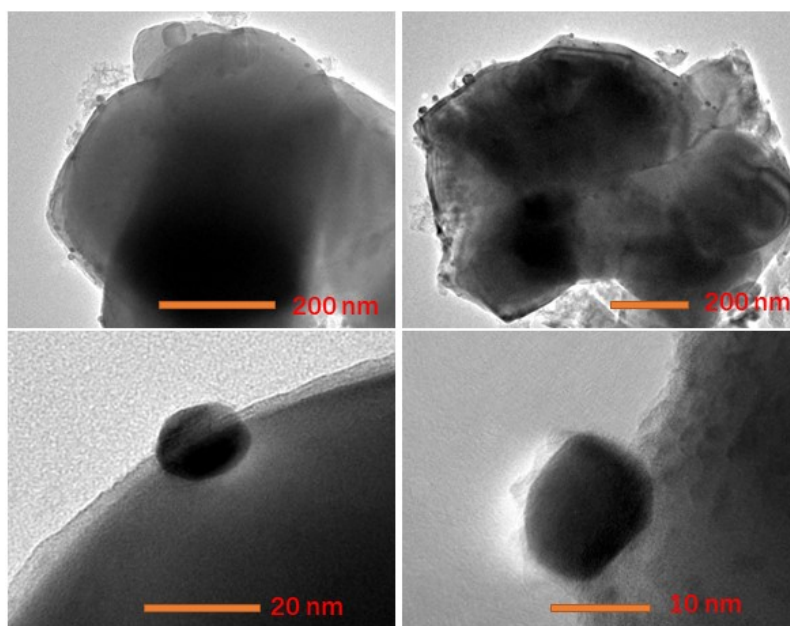
**Fig. S3** HR-TEM of Ru/TiO<sub>2</sub>



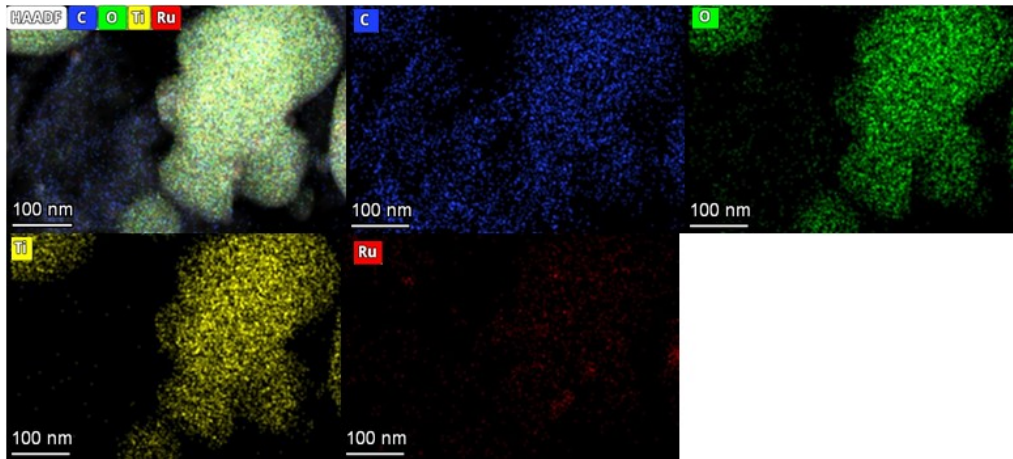
**Fig. S4** Particle size distribution of Ru/TiO<sub>2</sub>



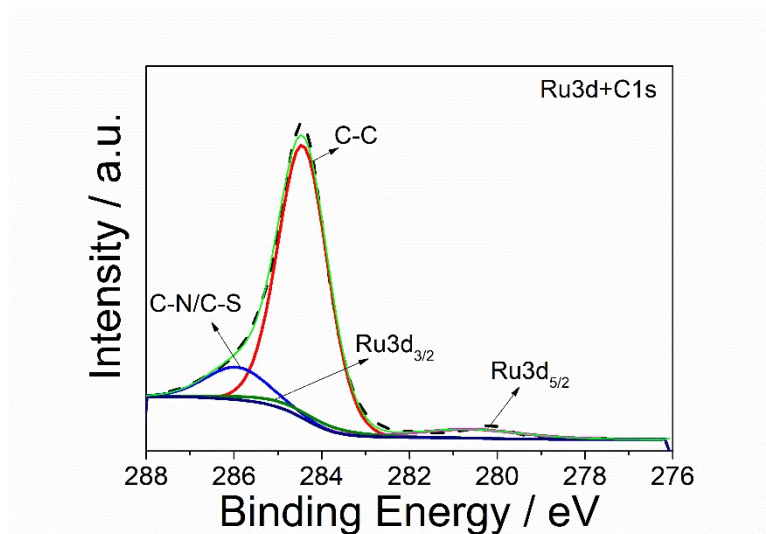
**Fig. S5** SEM of C/Ru/TiO<sub>2</sub>



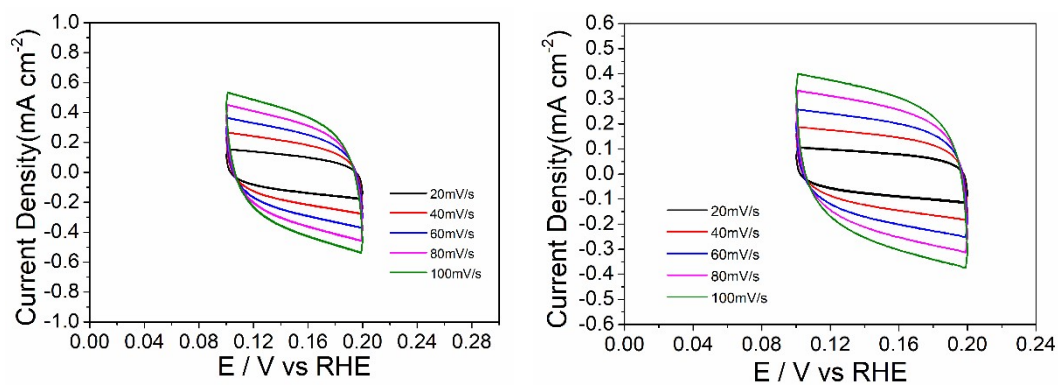
**Fig. S6** TEM of C/Ru/TiO<sub>2</sub>



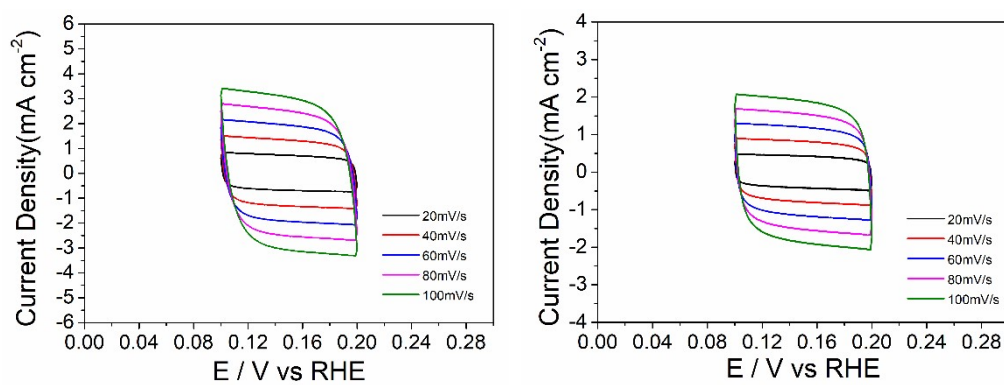
**Fig. S7** TEM-EDS Mapping of C/Ru/TiO<sub>2</sub>



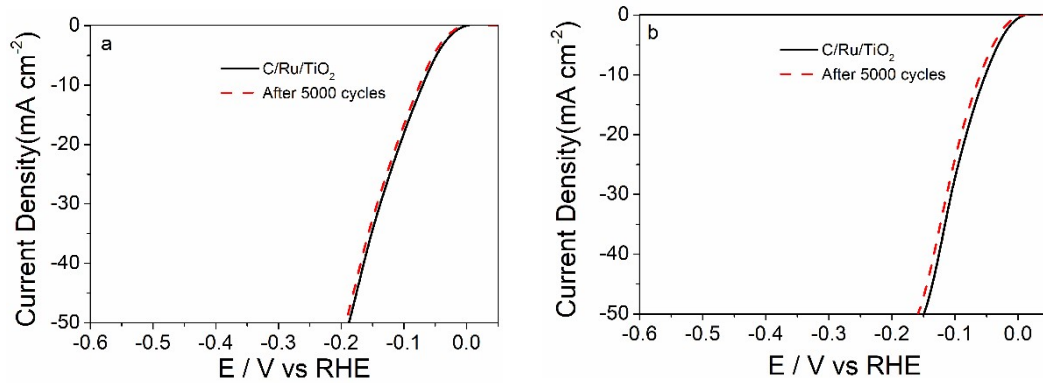
**Fig. S8** High-resolution XPS spectra for Ru<sub>3d</sub>+C<sub>1s</sub>



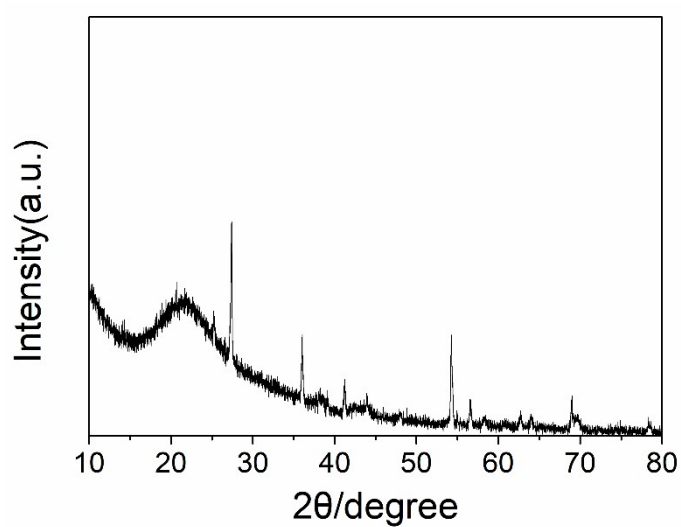
**Fig. S9** CV curves of Ru/TiO<sub>2</sub>, (left) in 1 M KOH, (right) in 0.5 M H<sub>2</sub>SO<sub>4</sub>



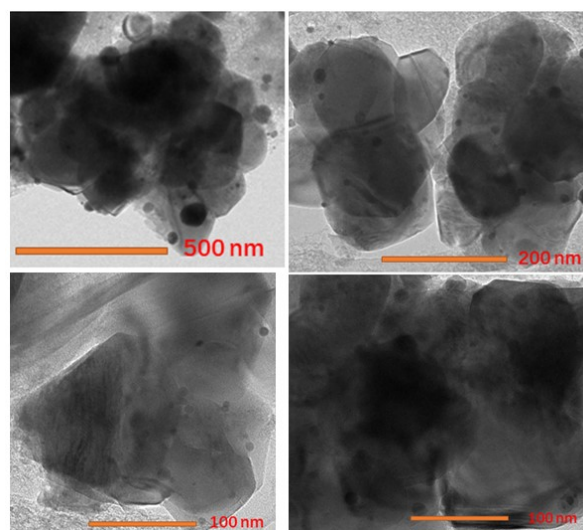
**Fig. S10** CV curves of C/Ru/TiO<sub>2</sub>, (left) in 1 M KOH, (right) in 0.5 M H<sub>2</sub>SO<sub>4</sub>



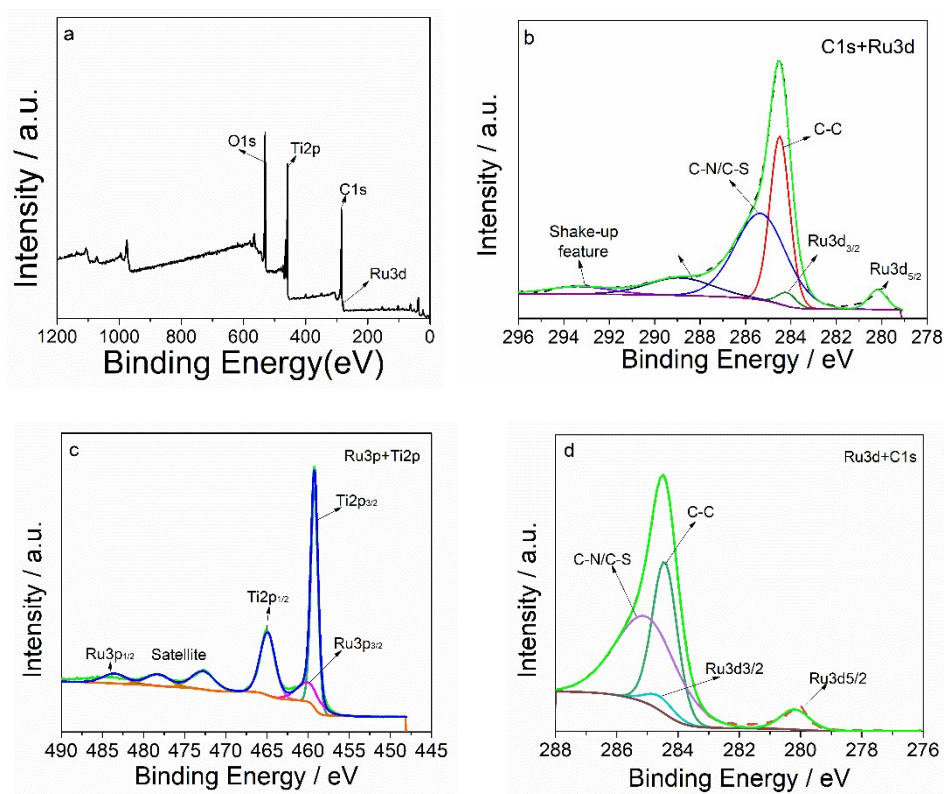
**Fig. S11** LSVs of C/Ru/TiO<sub>2</sub> catalysts before and after 5000 CV cycles in 0.5 M H<sub>2</sub>SO<sub>4</sub> (left) and 1M KOH (right).



**Fig. S12** XRD of C/Ru/TiO<sub>2</sub> after 5000 CV cycles



**Fig. S13** TEM of C/Ru/TiO<sub>2</sub> after 5000 CV cycles



**Fig. S14** (a) XPS survey spectra of C/Ru/TiO<sub>2</sub> after 5000 CV cycles, (c-d) high-resolution XPS spectra of C<sub>1s</sub>, Ti<sub>2p</sub>, Ru<sub>3d</sub>



**Table S1.** Summary of HER catalytic activities of C/Ru/TiO<sub>2</sub> and some other catalysts reported in recent literatures (the potential is obtained at a current density of 10 mA cm<sup>-2</sup> for HER in 0.5 M H<sub>2</sub>SO<sub>4</sub>).

Catalysts	HER Overpotential @10 mA cm <sup>-2</sup> (mV)	Tafel Slope (mV dec <sup>-1</sup> )	Ref.
<b>C/Ru/TiO<sub>2</sub></b>	<b>69</b>	<b>70</b>	<b>In this work</b>
Pt <sub>0.095</sub> -Ru <sub>2</sub> P@Ru/CNT	27	20	1
h-RuNS	154	102	2
Ru/CoxP@NC	165	55	3
Ru/Ni <sub>2</sub> P@NPC	89	62	4
RuP <sub>2</sub> /CNT	58	57	5
Ru@Co/N-CNTs	92	53	6
Rh-Rh <sub>2</sub> P@C	24	36	7
Ru/CN	127	/	8
Ru-MoS <sub>2</sub>	300	/	9
C <sub>3</sub> N <sub>4</sub> -Ru-F	29	/	10
Pt <sub>1</sub> Ru <sub>1</sub> /NMHCS-A	22	38	11
Ru <sub>1</sub> CoP/CDs	49	52	12

RuSA-N-S-Ti <sub>3</sub> C <sub>2</sub> Tx	76	90	13
A-Pt	18.8	27.8	14
Ru-N/BC	79	62	15

**Table S2.** Summary of HER catalytic activities of C/Ru/TiO<sub>2</sub> and some other catalysts reported in recent literatures (the potential is obtained at a current density of 10 mA cm<sup>-2</sup> for HER in 1 M KOH).

Catalysts	HER Overpotential @10 mA cm <sup>-2</sup> (mV)	Tafel Slope (mV dec-1)	Ref.
<b>C/Ru/TiO<sub>2</sub></b>	<b>51</b>	<b>68</b>	<b>In this work</b>
Ni <sub>1</sub> Ru <sub>1</sub> /C	13	33	16
Pt <sub>0.095</sub> -Ru <sub>2</sub> P@Ru/CNT	14	31	17
NiRu@MWCNTs	14	32	18
RuNi <sub>1</sub> Co <sub>1</sub> @CMT	78	77	19
Ru-Ni <sub>0.85</sub> Co <sub>0.15</sub> Se/NF	18	35	20
Ru MNSs	24	34	21
Ru <sub>1</sub> CoP/CDs	51	73	22
Ru <sub>0.10</sub> @2H-MoS <sub>2</sub>	51	65	23
Ru/Co <sub>3</sub> O <sub>4</sub> NWs	31	70	24
FeRu NPs/C	33	43	25
Ru@NiCo-MOF HPNs	284	/	26

RuCo@NC	280	/	27
RuCo@C-350	91	83	28
Ru@C <sub>2</sub> N	17	38	29
Ru-MoS <sub>2</sub> /CNT	50	62	30

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