Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Ultrathin IrRu Nanowires Network with high performance and durability for Hydrogen Oxidation Reaction in alkaline anion exchange membrane fuel cell

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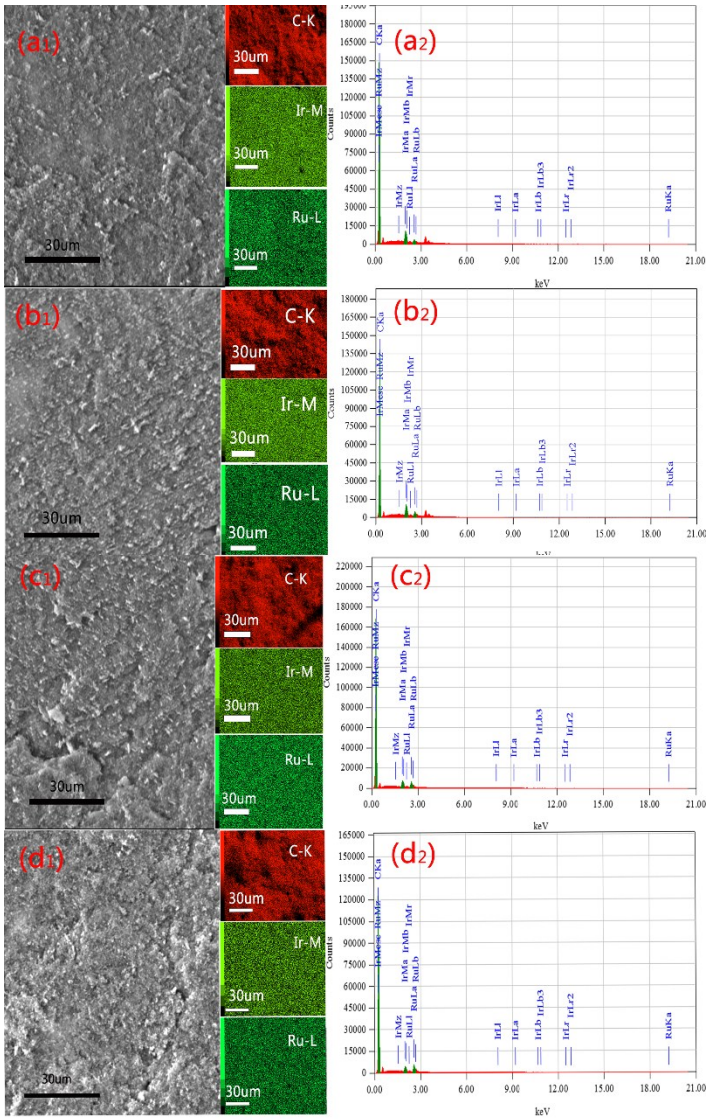

Fig S1. SEM and Mapping of (a_1) Ir_2Ru_1 NWs /C and (a_2) EDS analysis, (b_1) Ir_1Ru_1 NWs /C and (b_2) EDS analysis (c_1) Ir_1Ru_2 NWs /C and (c_2) EDS analysis (d_1) Ir_1Ru_3 NWs /C and (d_2) EDS analysis

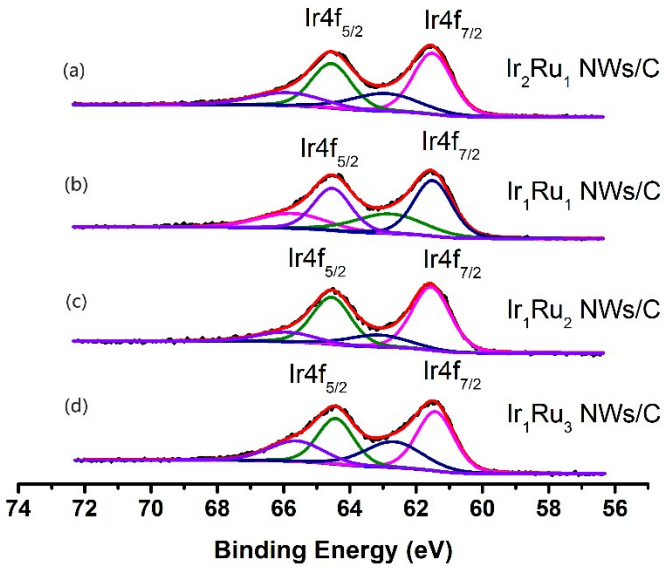

Fig S2. XPS spectra of Ir 4f for (a) Ir_2Ru_1 NWs/C, (b) Ir_1Ru_1 NWs/C,(c) Ir_1Ru_2 NWs/C,(d) Ir_1Ru_3 NWs/C.

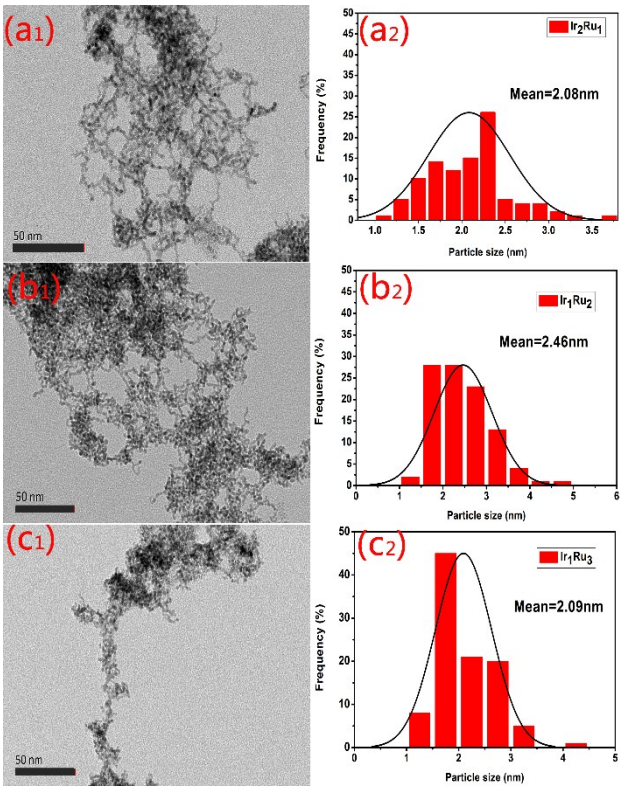

Fig S3. TEM images and the corresponding size distribution diagrams of Ir_2Ru_1 NWs (a_1 and a_2), Ir_1Ru_2 NWs (b_1 and b_2) and Ir_1Ru_3 NWs (c_1 and c_2).

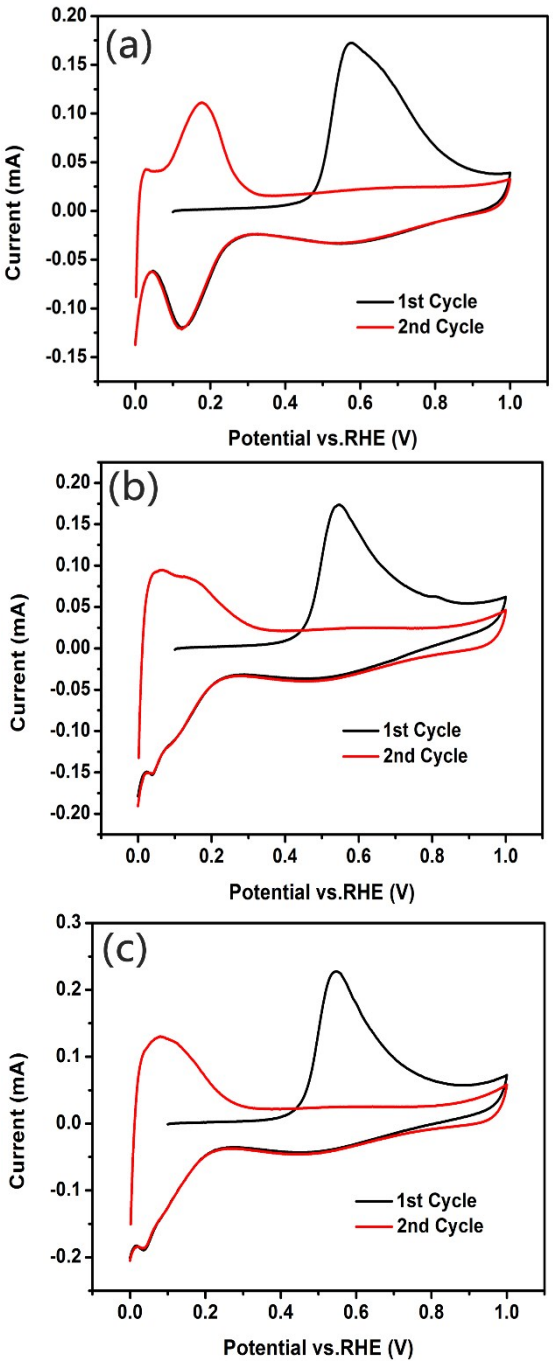

Fig S4. CO-stripping voltammetry for of Ir_2Ru_1 NWs (a), Ir_1Ru_2 NWs (b) and Ir_1Ru_3 NWs (c).

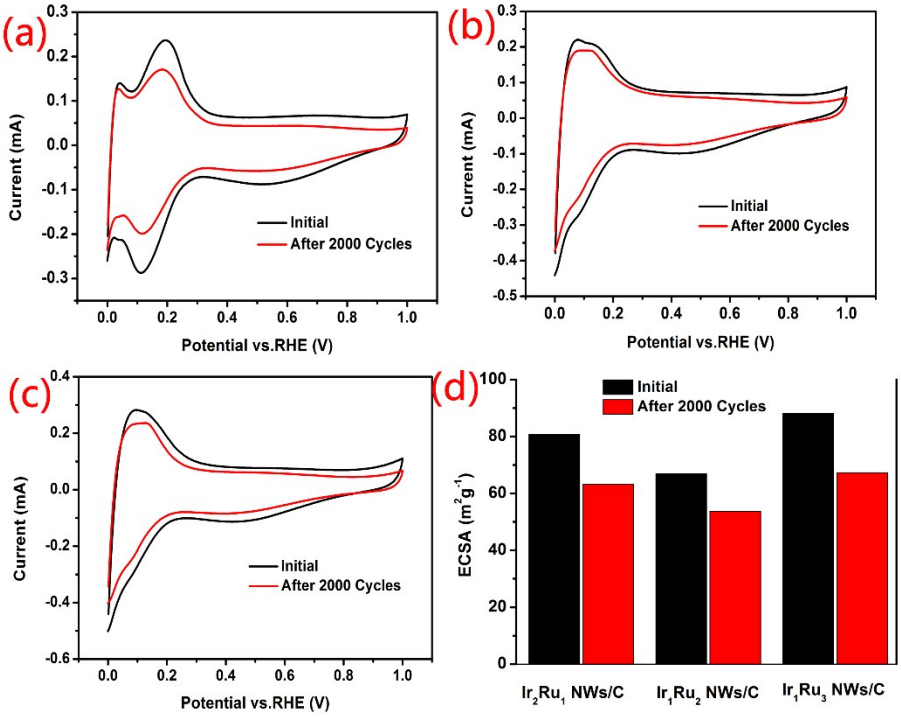

Fig S5. Cyclic voltammograms of Ir_2Ru_1 NWs (a), Ir_1Ru_2 NWs (b) and Ir_1Ru_3 NWs (c) and the corresponding ECSA (d) before and after half-cell-ADTs .

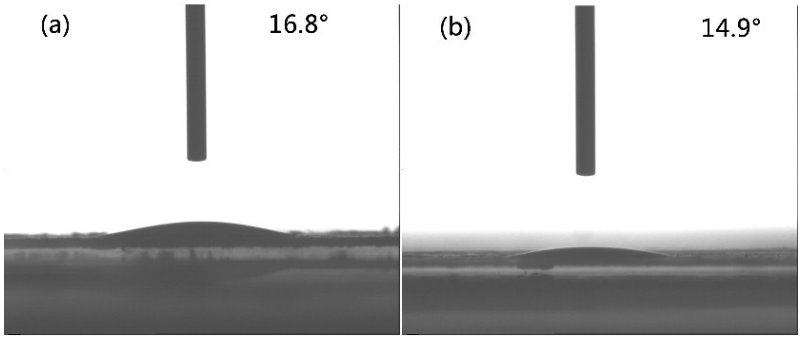

Fig S6. Contact angle of GDE with (a) Pt/C and (b) Ir_1Ru_1 NWs /C as anode catalysts

Table S1. The compositions of four different IrRu NWs/C catalysts.

catalyst	Nominal Ir:Ru (atomic)	Composition from EDS analysis			Composition from ICP analysis		
		Ir (wt %)	Ru (wt %)	Ir:Ru (atomic)	Ir (wt %)	Ru (wt %)	Ir:Ru (atomic)
IrRu NWs/C	2:1	15.96	4.93	60.21:39.79	13.30	4.54	60.63:39.37
	1:1	14.99	6.68	51.05:48.95	14.31	6.79	52.55:47.45
	1:2	9.88	9.55	32.94:67.06	8.96	9.41	33.37:66.63
	1:3	8.47	11.67	25.89:74.11	7.33	10.87	26.16:73.84

Table S2 Exchange current density, mass activity@50mV, Specific activity @50mV, for the HOR in base electrolytes on different electrocatalytic materials.

Material	Experiment Conditions	Method	i_0 ($mAcm_{metal}^{-2}$)	Mass activity@50mV ($A\ g^{-1}$)	Specific activity@50 mV ($mA\ cm_{metal}^{-2}$)	Ref.
Pt (110)	0.1 M KOH, 25 °C,	micro	0.7	---	1.0	1
Pt (110)	0.1 M KOH, 25 °C,	micro	0.05	---	0.068	1
Pt(111)	0.1 M KOH, 25 °C,	micro	0.04	---	0.068	1
46% Pt/C (Tanaka)	0.1 M KOH, 25 °C	micro	0.05	---	0.34	2
50% Ru/C (2.2 nm)	0.1 M KOH, 25 °C	micro	0.030	---	---	3
50% Ru/C (2.4 nm)	0.1 M KOH, 25 °C	micro	0.043	---	---	3
50% Ru/C (3.1 nm)	0.1 M KOH, 25 °C	micro	0.063	162	0.64	3
50% Ru/C (3.4 nm)	0.1 M KOH, 25 °C	micro	0.056	---	---	3
50% Ru/C (3.9 nm)	0.1 M KOH, 25 °C	micro	0.044	---	---	3

50% Ru/C (4.1 nm)	0.1 M KOH, 25 °C	micro	0.045	---	---	3
50% Ru/C (5.1 nm)	0.1 M KOH, 25 °C	micro	0.046	---	---	3
50% Ru/C (6.6 nm)	0.1 M KOH, 25 °C	micro	0.038	---	---	3
20% Ir/C (Premetek)	0.1 M NaOH, 40 °C	micro	0.38	448.4	0.76	4
20% Ir/C (Premetek)	0.1 M KOH, 20 °C	---	---	313	0.49	5
Pt/C	0.1 M KOH, 25 °C	micro	0.107	338	0.712	This work
Ir_1Ru_1 NWs/C	0.1 M KOH, 25 °C	micro	0.126	1416	2.682	This work

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