Supporting Information

In-situ Surface Reduction to Accessing Atomically Dispersed Platinum on Carbon Sheets for Acidic Hydrogen Evolution

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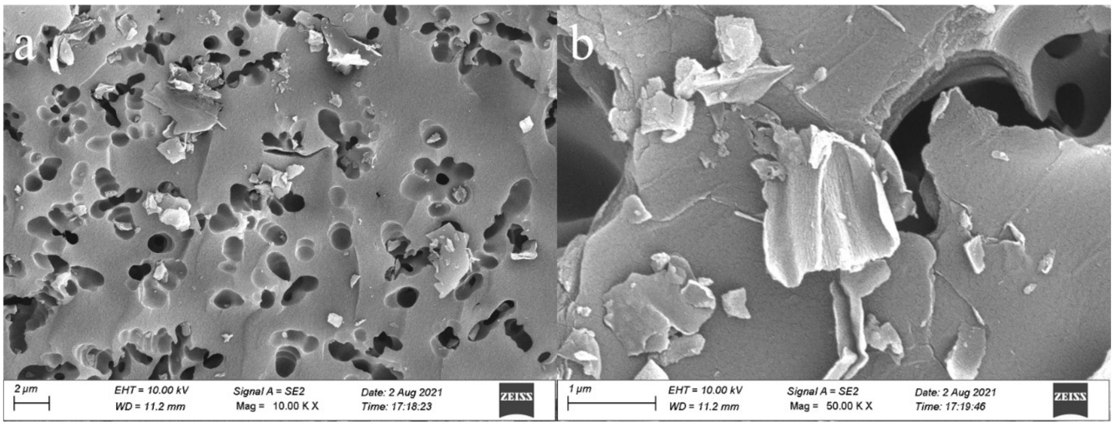

Figure 1. (a) Low and (b) high magnification scanning electron microscopy (SEM) images of the synthetic Pt-DC material.

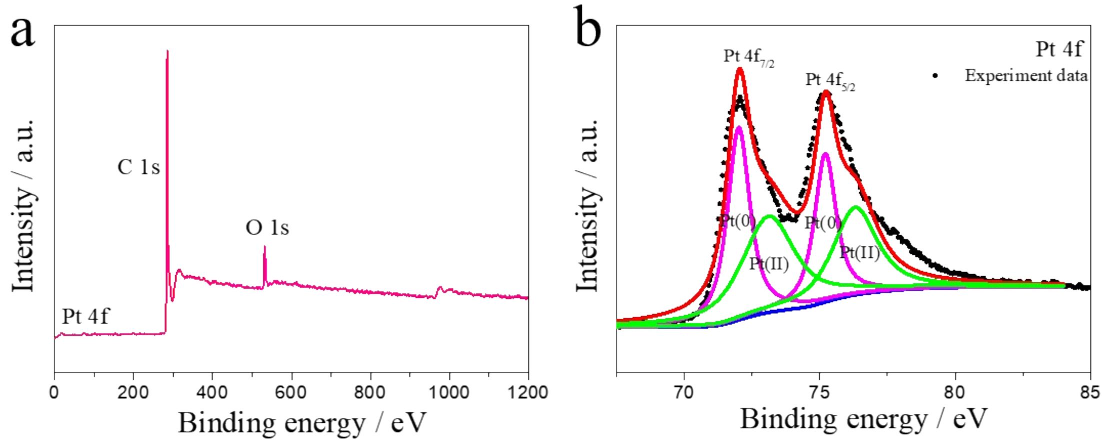

Figure 2. (a) Survey X-ray photoelectron spectroscopy (XPS) of the synthetic Pt-DC material. (b) The Pt 4f region of the XPS for Pt/C (JM) sample.

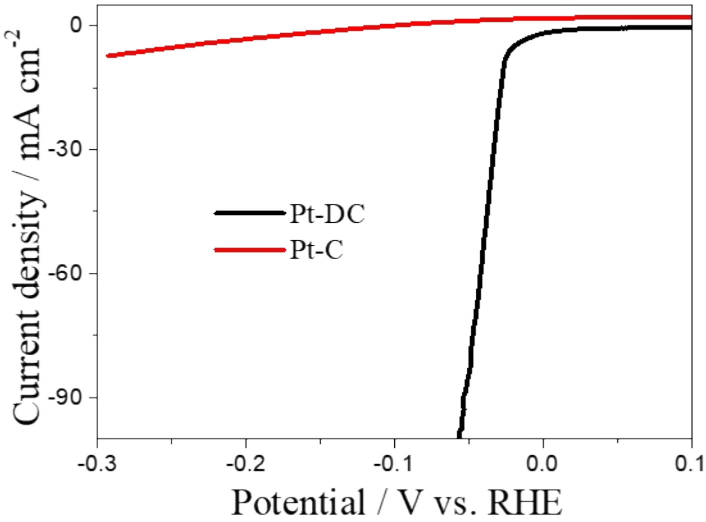

Figure 3. Linear sweep voltammetry (LSV) with iR compensation at a scan rate of 10 mV/s in 0.5 M H_2SO_4 electrolyte for the Pt-DC catalyst compared to the Pt-C catalyst.

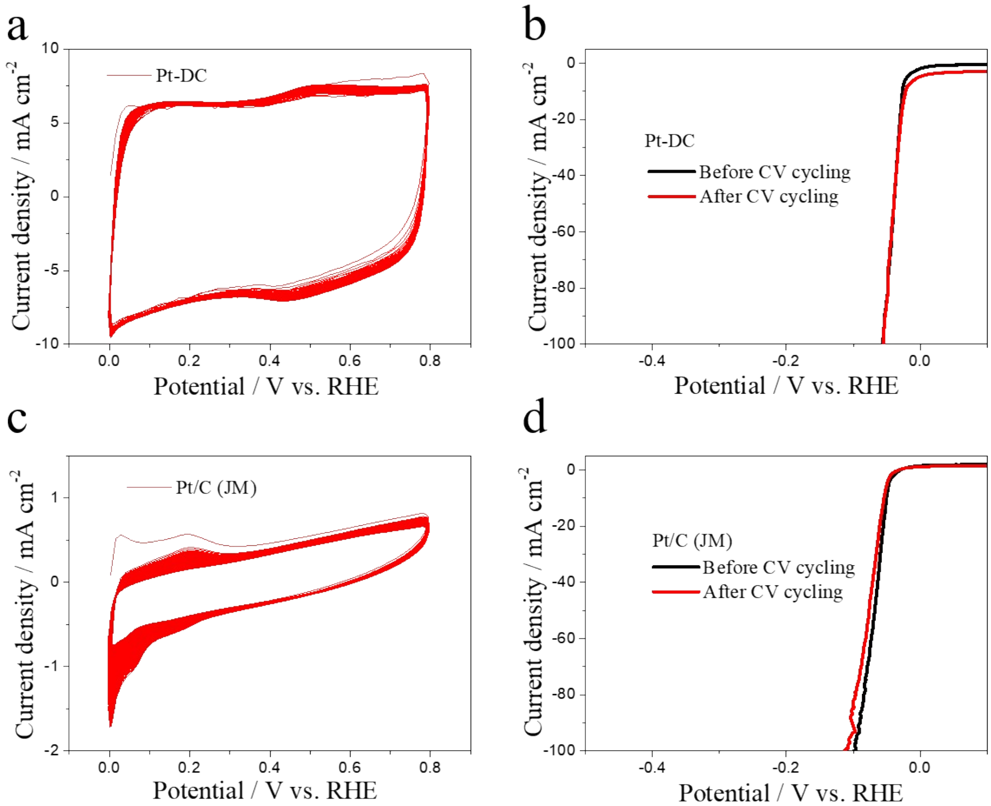

Figure 4. (a and c) Long-term cyclic voltammetry (2000 cycles) tests for Pt-DC and Pt/C (JM) catalysts in 0.5 M H_2SO_4 electrolyte, and (b and d) the LSV curves with iR compensation before and after the CV tests.

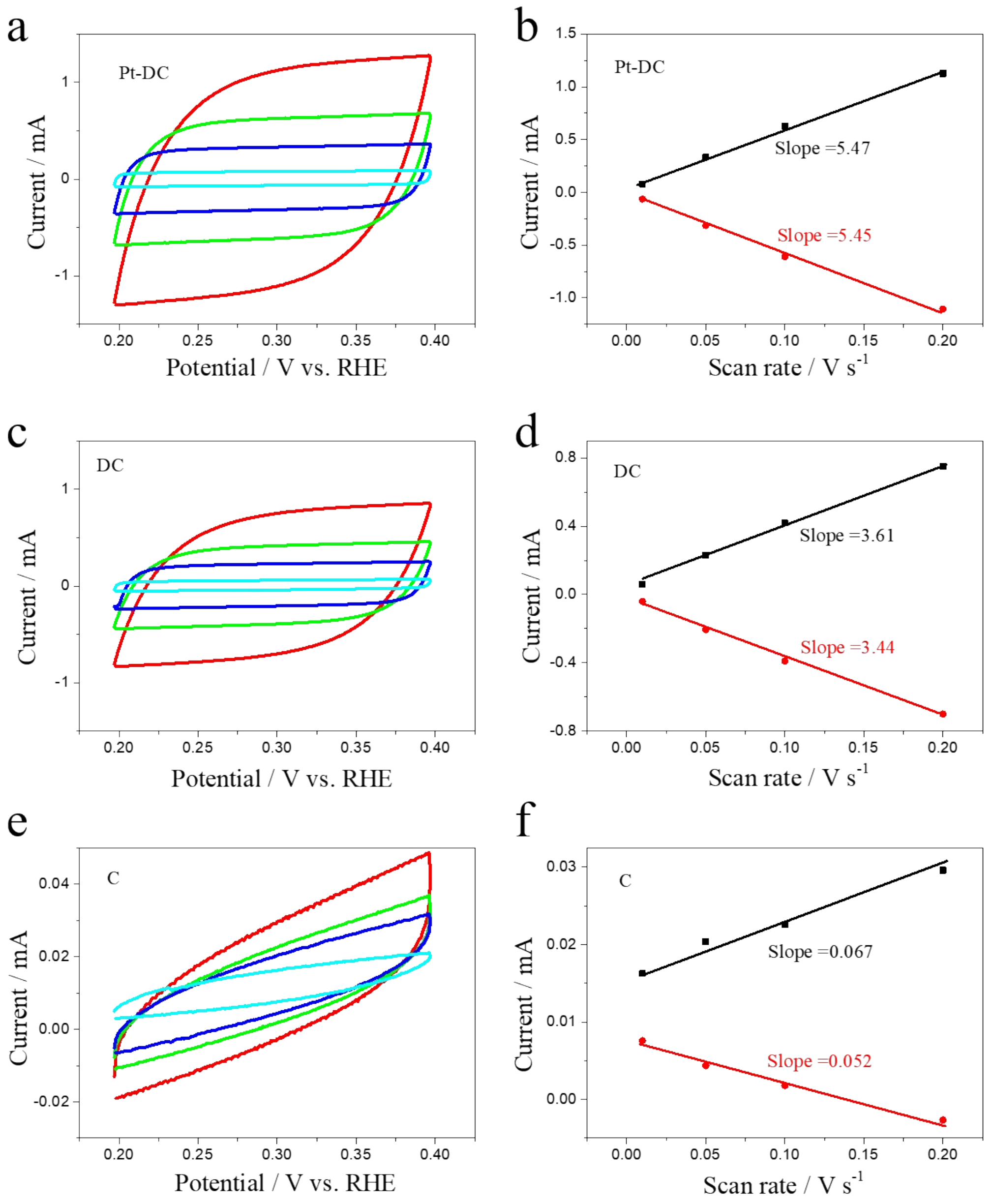

Figure 5. Cyclic voltammetry tests of (a) Pt-DC, (B) DC and (c) C at different scan rates in a non-Faradaic region, and the corresponding relationship of current and scan rate (b, d and f) for the calculation of the electrochemical double-layer capacitance (C_{dl}).

Table 1. Acidic HER performance comparison of different noble metal-based catalysts.

Electrocatalyst	Noble metal loading (mg cm^{-2})	Overpotential@10 mA cm^{-2} (mV)	Overpotential at other currents	Tafel slope (mV dec^{-1})	Reference
Pt-DC	**0.00416**	**25**	**55 mV@100 mA cm^{-2}**	**30**	**This work**
Ru/triNC	0.0479	2	25 mV@35 mA cm^{-2}	32.1	Adv. Energy Mater., 2020, 2000067.
RuNP@PDA	0.0476	27.5	160 mV@100 mA $cm^{-2\,\#}$	37	ACS Catal., 2018, 8, 5714.
Ru/GDY	0.00475	44	125 mV@100 mA $cm^{-2\,\#}$	30	Nano Energy, 72, 104667
Ir-NSG	0.025	$27^{\#}$	33 mV@30 mA $cm^{-2\,\#}$	19.2	Nat. Commun., 2020, 11, 4246.
Ir-SA@Fe@NCNT	0.0011	26	85 mV@100 mA $cm^{-2\,\#}$	31.8	Nano Lett., 2020, 20, 2120.
RuB_2	0.47	52	52 mV@50 mA cm^{-2}	66.9	ACS Energy Lett., 2020, 5, 2909.
Rh_3Cu_1	0.0249	-	80 mV@90 mA $cm^{-2\,\#}$	33	Adv. Energy Mater., 2020, 1903038.
Li-$IrSe_2$	0.137	225	75 mV@40 mA	-	Angew.

			cm^{-2} #		Chem. Inter. Ed., 58, 14764.
$RuTe_2$	0.0575	38	60 mV@25 mA cm^{-2} #	-	Nat. Commun., 2019, 10, 5692.
$Pt_{62}Co_{23}Ir_{15}$	0.0103	14	17 mV@40 mA cm^{-2} #	-	Chem. Mater., 2019, 31, 8136.
Co-RuIr	0.0423	14	23 mV@17.5 mA cm^{-2} #	31.1	Adv. Mater., 2019, 1900510.
IrNi	0.0078	25	32 mV@20 mA cm^{-2} #	29.7	Small Methods, 2019, 1900129.

#: data were read from figures in literature.