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Electronic Supplementary Information

From monometallic Au nanowires to trimetallic AuPtRh nanowires: interface control for the formic acid electroxidation†

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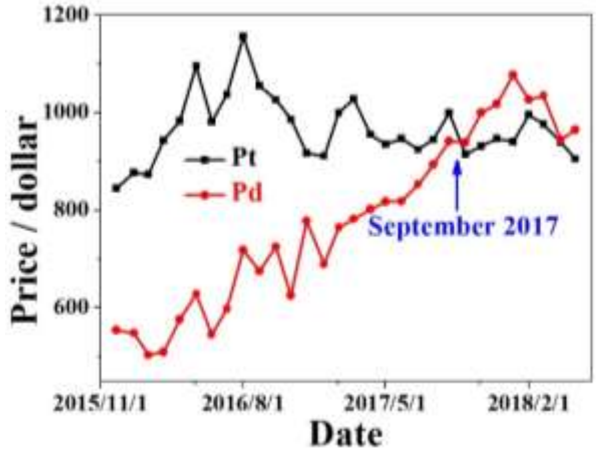

Fig. S1 Johnson Matthey base price chart of Pt and Pd between December 2015 and May 2018.

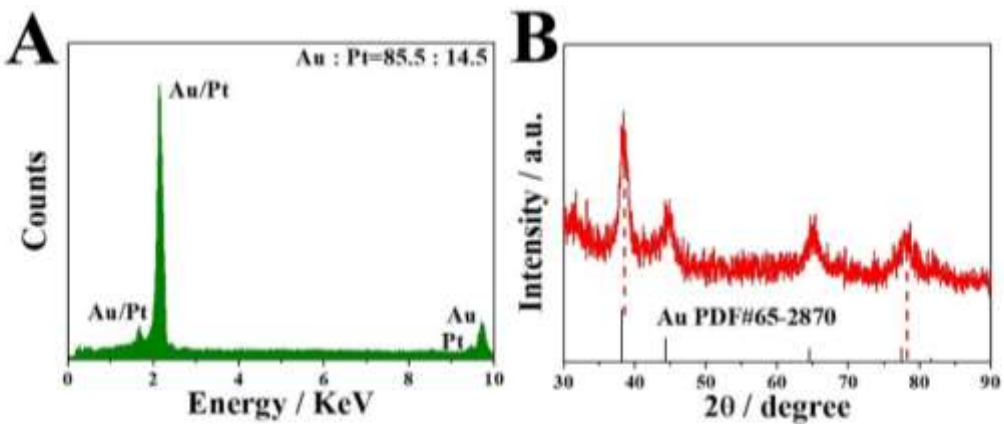

Fig. S2 (A) EDX spectrum and (B) XRD pattern of Au_6Pt_1 NWs.

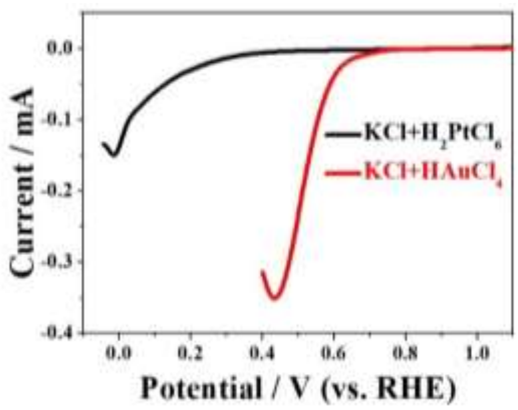

Fig. S3 Linear sweep voltammetry curves of the mixed solution of 0.1 M KCl + 0.01 M H_2PtCl_6 and 0.1 M KCl + 0.01M $HAuCl_4$ solution on the glassy carbon electrode at 50 mV s^{-1}.

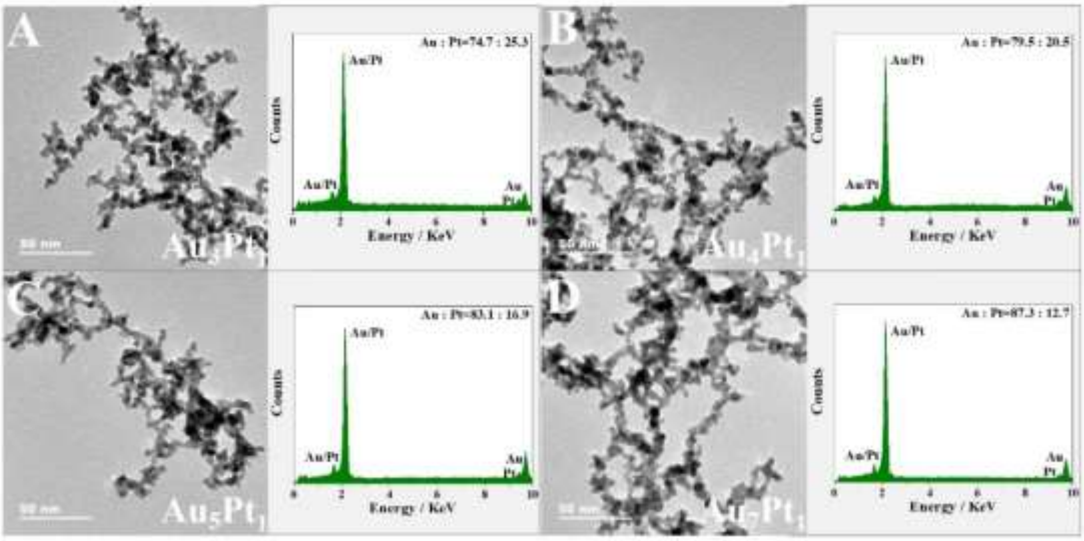

Fig. S4 TEM images and EDX spectra of (A) Au_3Pt_1 NWs, (B) Au_4Pt_1 NWs, (C) Au_5Pt_1 NWs, and (D) Au_7Pt_1 NWs.

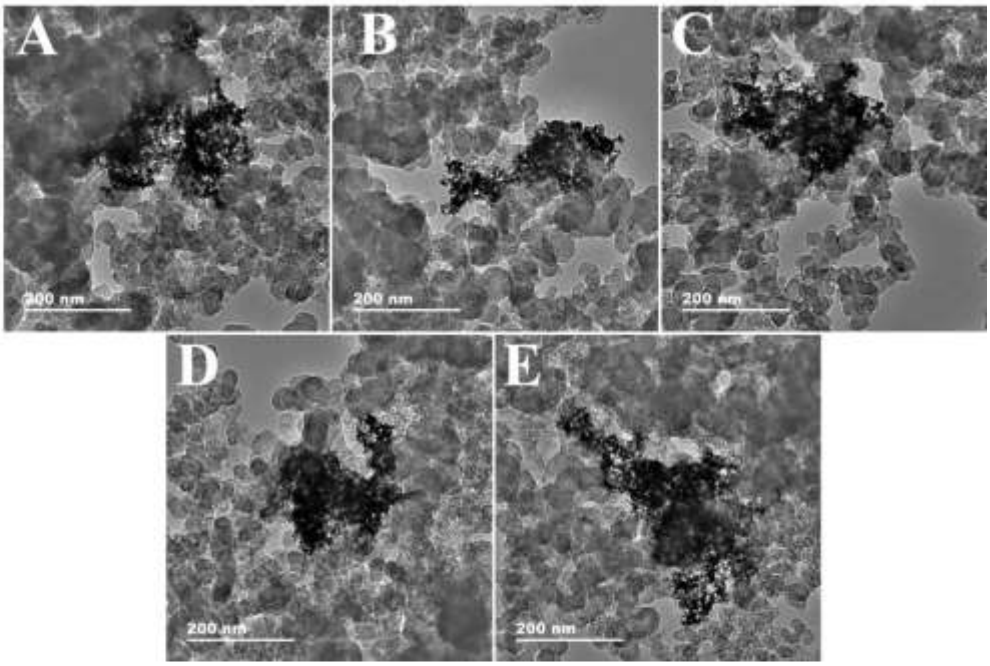

Fig. S5 TEM images of (A) Au_3Pt_1/C, (B) Au_4Pt_1/C, (C) Au_5Pt_1/C, (D) Au_6Pt_1/C, and (E) Au_7Pt_1/C.

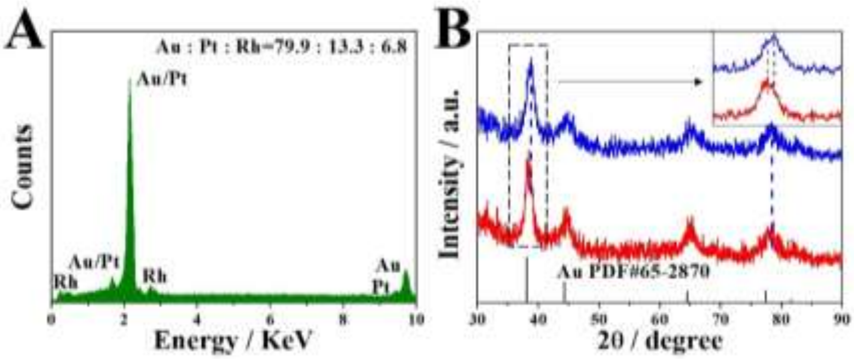

Fig. S6 (A) EDX spectrum of $Au_6Pt_1Rh_{0.5}$ NWs. (B) XRD patterns of Au_6Pt_1 NWs and $Au_6Pt_1Rh_{0.5}$ NWs.

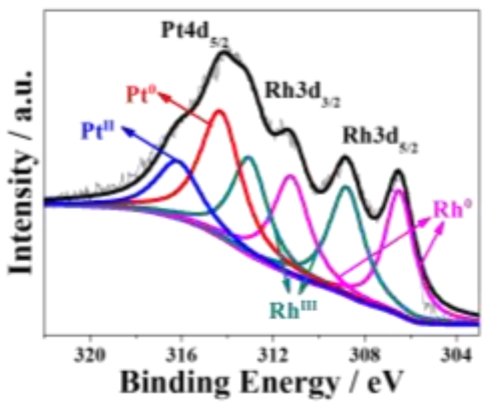

Fig. S7 Rh 3d XPS spectra of $Au_6Pt_1Rh_{0.5}$.

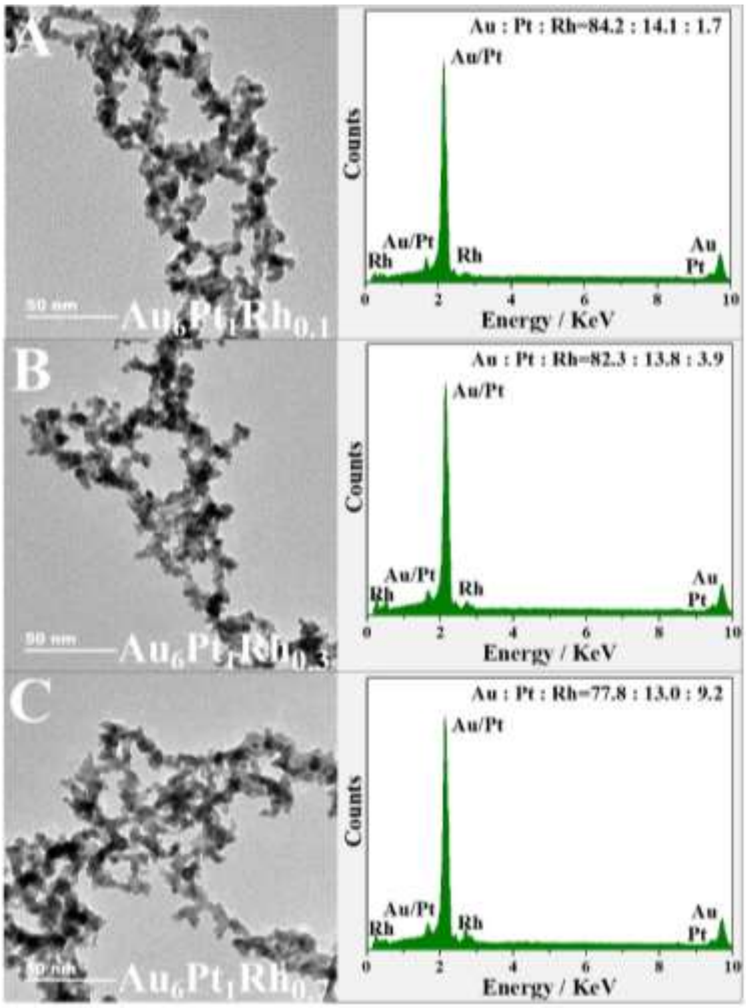

Fig. S8 TEM images and EDX spectra of (A) $Au_6Pt_1Rh_{0.1}$ NWs, (B) $Au_6Pt_1Rh_{0.3}$ NWs, and (C) $Au_6Pt_1Rh_{0.7}$ NWs.

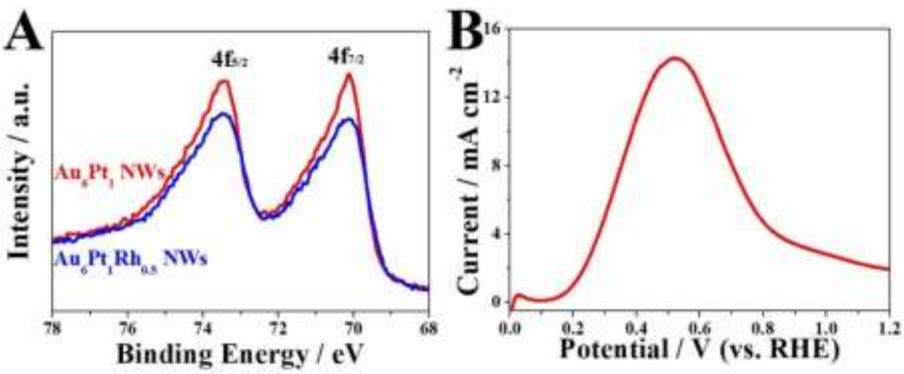

Fig. S9 (A) Pt 4f XPS spectra of Au_6Pt_1 NWs and $Au_6Pt_1Rh_{0.5}$ NWs. (B) ECSA-normalized positive direction CV scan curves of $Au_6Pt_1Rh_{0.5}$/C electrocatalysts in 0.5 M HCOOH + 0.5 M H_2SO_4 solution at scan rate of 50 mV s^{-1}.

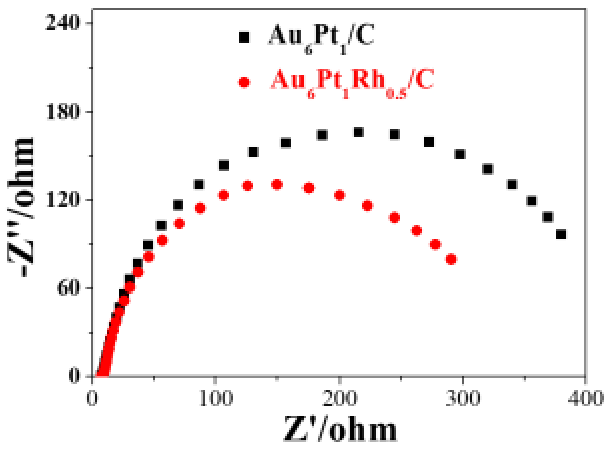

Fig. S10 EIS curves of $Au_6Pt_1Rh_{0.5}/C$ and commercial Au_6Pt_1/C in 0.5 M HCOOH + 0.5 M H_2SO_4 solution (applied potential: 0.4 V vs. RHE).

Table S1. The catalytic activity of recently reported Pt-based or Pd-based electrocatalysts for the FAOR.

Electrocatalysts	Electrolyte	Mass activity ($A\ mg_{Pt\ or\ Pd}^{-1}$)	Specific activity ($mA\ cm_{ECSA}^{-2}$)	Refs.	Year
$Au_6Pt_1Rh_{0.5}/C$	0.5 M HCOOH + 0.5 M H_2SO_4	8.05	14.3	This work	2018
	0.25 M HCOOH + 0.5 M H_2SO_4	4.47	7.92	This work	2018
	0.1 M HCOOH + 0.5 M H_2SO_4	2.24	3.97	This work	2018
$CuPd/WO_{2.72}$	0.1 M HCOOH + 0.1 M $HClO_4$	2.09	n.a.	1	2018
Au@Pt-graphene	0.1 M HCOOH + 0.1 M H_2SO_4	0.464	0.443	2	2018
PdH_x nanocatalysts	0.25 M HCOOH + 0.5 M H_2SO_4	1.06	5.12	3	2018
AgPt nanowires	1.0 M HCOOH + 0.5 M H_2SO_4	0.152	1.03	4	2018
Pt_3Ni tetrahexahedral nanoframes/C	0.5 M HCOOH + 0.1 M $HClO_4$	n.a.	~3.0	5	2017
PdCu nanosheets	0.25 M HCOOH + 0.5 M H_2SO_4	1.66	1.18	6	2017
$Pt_4PdCu_{0.4}$ nanoframes	0.1 M HCOOH + 0.1 M $HClO_4$	~1.29	~3.0	7	2017
Porous Pd nanosheets	0.5 M HCOOH + 0.5 M H_2SO_4	0.409	3.17	8	2017

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