Supporting Information

Photo-Assisted Synthesis of Au@PtAu Core-Shell Nanoparticles with Controllable Surface Composition for Methanol Electro-oxidation

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Table S1. Some reported mass activities of free-standing Pt-Au bimetallic nanomaterials for methanol electro-oxidation

Materials	Electrolytes	Mass activities（A mg^{-1}_{Pt}）	References
Pt-Au	0.5M CH_3OH+0.1M $HClO_4$ 50mV/s	0.8	[1]
$Au@PtAu_{0.5}$	**1M CH_3OH+0.1M $HClO_4$ 50mV/s**	**0.76**	**Our work**
Au_{30}-Pt_{array}	1M CH_3OH+0.5M H_2SO_4	0.66	[2]
Pt-Au	1M CH_3OH+1M $HClO_4$	0.625	[3]
Au-Pt alloyed nanowire	1M CH_3OH+0.5M H_2SO_4 50mV/s	0.58	[4]
Au-Pt core-rods	0.5M CH_3OH+0.5M H_2SO_4	0.561	[5]
Au@Pt (Pt_5Au)	1M CH_3OH+0.5M H_2SO_4 20mV/s	0.45	[6]
Pt-on-Au	1M CH_3OH+0.5M H_2SO_4 50mV/s	~0.43	[7]
$Pt_{0.81}Au_{0.19}$ alloy core-Pt shell	2M CH_3OH+0.1M H_2SO_4	0.426	[8]
Pt-Au	?CH_3OH+0.1M $HClO_4$	~0.38	[9]
Pt-Au alloy	0.5M CH_3OH+0.5M H_2SO_4 50mV/s	0.348	[10]
Au-Pt nanowire	1M CH_3OH+0.1M $HClO_4$	~0.34	[11]
Au@Pt	2M CH_3OH+0.5M H_2SO_4 50mV/s	0.149	[12]
Au@Pt	0.5M CH_3OH+0.5M H_2SO_4 50mV/s	~0.115	[13]

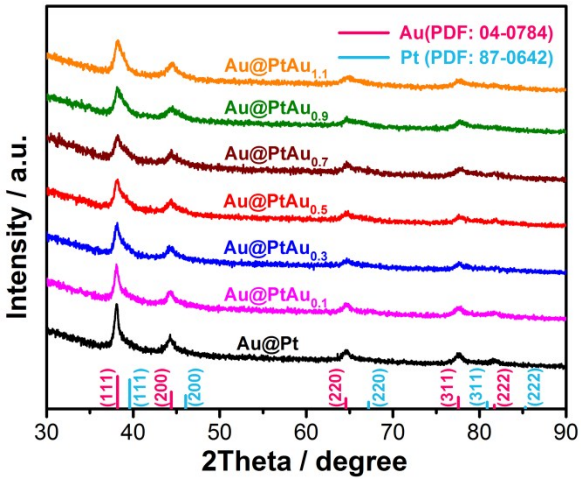

Fig. S1 The XRD patterns of the as-prepared Au@PtAu$_m$ NPs, with m: 0-1.1.

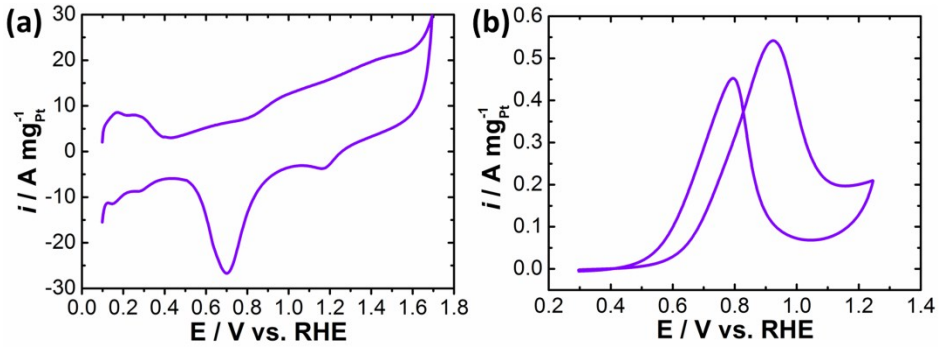

Fig. S2 The cyclic voltammetry curve (a) and current density (b) toward methanol electro-oxidation in 0.1M $HClO_4$ of Au@PtAu$_{0.5}$ NPs prepared without photo-irradiation. The scan rates are 100mV/s and 50mV/s, respectively.

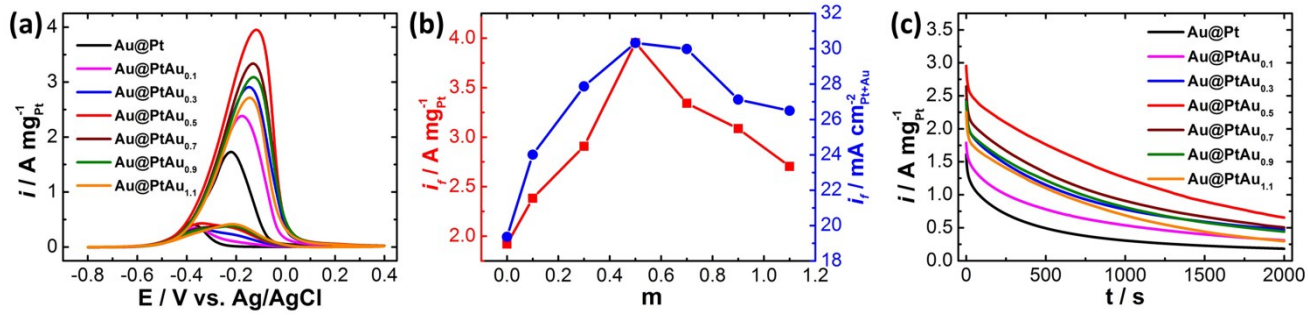

Fig. S3 Activity, durability and activity variation trend of Au@PtAu$_m$ NPs toward methanol electro-oxidation. (a) Current densities of Au@PtAu$_m$ NPs toward methanol electro-oxidation in 1M KOH at 50mV/s. (b) Catalytic activities (corresponding to the peak current densities) variation trend of the as-prepared Au@PtAu$_m$ NPs normalized either by Pt mass (red curve) or EASA of Pt and Au (blue curve). (c) Long term current-time curves measured in 1M KOH+1M CH_3OH at -0.2V vs. Ag/AgCl.

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