

## **Supporting Information**

# **Low Dimensional Platinum-Based Bimetallic Nanostructures for Advanced Catalysis**

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**Table S1.** Summary of activity and stability of low-D Pt based catalysts for ORR.

Catalyst	Electrolyte	Mass Activity at 0.9 V	Specific Activity at 0.9 V	Stability	Reference
Ultrafine Jagged Platinum Nanowires	0.1 M HClO <sub>4</sub>	13.6 A mg <sup>-1</sup>	10.8 mA cm <sup>-2</sup>	Mass activity: 11.9 A mg <sup>-1</sup> and specific activity: 0.98 mA cm <sup>-2</sup> after 6000 cycles	Science 2016, 354, 1414-1419
PtCo Nanowires	0.1 M HClO <sub>4</sub>	3.71 A mg <sup>-1</sup>	7.12 mA cm <sup>-2</sup>	Mass activity: 3.41 A mg <sup>-1</sup> <sub>Pt</sub> after 20000 cycles	Nat. Commun. 2016, 7, 11850
PtNiCo Ultrathin Nanowires	0.1 M HClO <sub>4</sub>	4.20 A mg <sup>-1</sup>	5.11 mA cm <sup>-2</sup>	Mass activity: 3.5 A mg <sup>-1</sup> <sub>Pt</sub> after 30000 cycles	Sci. Adv. 2017, 3, e1601705
PtNiRh Trimetallic Nanowires	0.1 M HClO <sub>4</sub>	2.88 A mg <sup>-1</sup>	2.71 mA cm <sup>-2</sup>	Mass activity: 2.51 A mg <sup>-1</sup> after 10000 cycles	J. Am. Chem. Soc. 2018, 140, 16159- 16167
Ultrathin Rh doped Pt Nanowires	0.1 M HClO <sub>4</sub>	1.41 A mg <sup>-1</sup>	1.63 mA cm <sup>-2</sup>	Mass activity: 1.28 A mg <sup>-1</sup> after 10000 cycles	J. Am. Chem. Soc. 2017, 139, 8152- 8159
Pd@Pt Nanowires	0.1 M HClO <sub>4</sub>	0.17 A mg <sub>Pt+Pd</sub> <sup>-1</sup>	0.4 mA cm <sup>-2</sup>	Mass activity: 0.323 A mg <sub>Pt+Pd</sub> <sup>-1</sup> and specific activity: 0.98 mA cm <sup>-2</sup> after 60000 cycles	J. Am. Chem. Soc. 2015, 137, 7862- 7868
PtNiPd Nanowires	0.1 M HClO <sub>4</sub>	1.93 A mg <sup>-1</sup>	3.48 mA cm <sup>-2</sup>	Mass activity: 1.78 A mg <sup>-1</sup> after 10000 cycles	Adv. Mater. 2017, 29, 1603774
Zigzag-Like PtFe Nanowires	0.1 M HClO <sub>4</sub>	2.11 A mg <sup>-1</sup>	4.34 mA cm <sup>-2</sup>	Mass activity: 1.59 A mg <sup>-1</sup> and specific activity: 3.18 mA cm <sup>-2</sup> after 50000 cycles	Adv. Mater. 2018, 30, 1705515
PtPb/Pt Nanoplate	0.1 M HClO <sub>4</sub>	4.3 A mg <sup>-1</sup>	7.8 mA cm <sup>-2</sup>	Mass activity: 3.97 A mg <sup>-1</sup> after 50000 cycles	Science 2016, 354, 1410-1414
PtPb Nanoplate	0.1 M HClO <sub>4</sub>	0.84 A mg <sup>-1</sup>	1.01 mA cm <sup>-2</sup>	Mass activity: 0.75 A mg <sup>-1</sup> and specific activity: 0.92 mA cm <sup>-2</sup>	Small 2018, 14, 1702259

Pd <sub>3</sub> Pb/Pd Nanosheet	0.1 M KOH	0.469 A mg <sub>Pd</sub> <sup>-1</sup>	1.31 mA cm <sub>Pd</sub> <sup>-2</sup>	after 50000 cycles Mass activity: 0.43 A mg <sub>Pd</sub> <sup>-1</sup> after 20000 cycles	Nano Lett. 2019, 192, 1336-1342
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**Table S2.** Summary of activity and stability of low-D Pt based catalysts for HER.

Catalyst	Electrolyte	Electrocatalytic Property	Stability	Reference
Pt-Ni Nanowires	1 M KOH	39.7 mA cm <sup>-2</sup> at -0.07 V	35.8 mA cm <sup>-2</sup> at -0.07 V after 3 h	Angew. Chem. Int. Ed. 2016,
	0.1 M KOH	23.0 mA cm <sup>-2</sup> at -0.07 V	21.1 mA cm <sup>-2</sup> at -0.07 V after 3 h	55, 12859 - 12863
Pt <sub>3</sub> Ni/NiS Nanowires	1 M KOH	37.2 mA cm <sup>-2</sup> at -0.07 V	Overpotential of 30 mV at 5 mA cm <sup>-2</sup> after 5 h	Nat. Commun. 2017, 8,
	0.1 M KOH	20.2 mA cm <sup>-2</sup> at -0.07 V		14580
Ultrathin Platinum Nanowires on Ni(OH) <sub>2</sub>	1 M KOH	2.48 mA cm <sup>-2</sup> at -0.07 V	2.37 mA cm <sup>-2</sup> at -0.07 V after 4000 s	Nat. Commun. 2015, 6,
	0.1 M KOH	6.31 mA cm <sup>-2</sup> at -0.07 V	6.20 mA cm <sup>-2</sup> at -0.07 V after 4000 s	6430
Ni at-PtNi Nanowires	1 M KOH	10.72 mA cm <sup>-2</sup> at -0.07 V	Overpotential of 30 mV at 5 mA cm <sup>-2</sup> after 5 h	Nat. Catal. 2019, 2,
		11.8 A mg <sup>-1</sup> at -0.07 V		495-503
N Modified Pt-Ni Nanowires	1 M KOH	Overpotential of 13 mV at 10 mA cm <sup>-2</sup>	Overpotential of ~ 30 mV at 40 mA cm <sup>-2</sup> after 10 h	Adv. Mater. 2019, 31,
Ultrathin PtNi-S Nanowires	1 M KOH	66.9 mA cm <sup>-2</sup> at -0.07 V	–	1807780 Angew. Chem. Int. Ed. 2018,
				57, 11678-11682