

## Supporting information

**Table S1** Mass activity, specific activity and stability of nanocatalyst FAOR

Sample	Mass activity/ (A·mg <sup>-1</sup> )	Specific activity/ (mA·cm <sup>-2</sup> )	Stability	Ref.
Pt <sub>1</sub> Ru <sub>2</sub> /MPC 950	2.40	9.50	1.39 h (ca. 2.20 A/mg) <sup>c</sup>	[1]
PTP bbi/PtBi NP	7.40	25.1	1 h (ca. 133 mA/mg) <sup>b</sup>	[2]
P-Pd <sub>50</sub> Au <sub>4</sub> Ag <sub>1</sub>	8.08	7.25	1000 cycles (6.43 A/mg) <sup>a</sup>	[3]
PtPb/Pt@sub-SbO	7.20	28.7	1.94 h (ca. 112 mA/mg) <sup>b</sup>	[4]
Pd/GiA	1.35	1.32	1 h (200 mA/mg) <sup>b</sup>	[5]
UCS PtZn iNPs	1.45	1.71	10000 cycles (94%) <sup>a</sup>	[6]
Rh/F-graphene-2	0.34	ca. 6.20	100 cycles (65%) <sup>a</sup>	[7]
PdMoP <sub>0.01</sub> /OB-CNT-N	2.18	N.A.	1 h (211 mA/mg) <sup>b</sup>	[8]
Pd/NPC-900	0.95	1.61	N.A.	[9]
Pt-ALs/CrN	5.17	N.A.	2000 cycles (94%) <sup>a</sup>	[10]
H-Pd-3	1.80	1.80	1000 cycles 60% <sup>a</sup>	[11]
Pt <sub>2</sub> -PtTe <sub>2</sub> HJNSAs/C	6.10	8.40	1.1 h (ca. 600 mA/mg) <sup>b</sup>	[12]
Pt/C@PL	1.19	2.86	500 cycles (1.19 A/mg) <sup>a</sup>	[13]
Pd <sub>85</sub> Cu <sub>15</sub> NCs	2.20	4.40	50 cycles (51.6%) <sup>a</sup>	[14]
Ni-Co-Cu-Pd (NCCP)	1.09	0.07	100 cycles (75%) <sup>a</sup>	[15]
USCSD Au <sub>61.2</sub> @Au <sub>27.3</sub> Pt <sub>11.5</sub> -NP/C	6.91	4.88	0.28 h (ca. 500 mA/mg) <sup>b</sup>	[16]
PdCuB Ngs/C	1.81	N.A.	1 h (177 mA/mg <sub>Pd</sub> ) <sup>b</sup>	[17]
PdNiCuP-A	0.74	3.12	100 cycles 53.1% <sup>a</sup>	[18]
Pd <sub>2</sub> Ni <sub>1</sub> /CNTs	3.35	N.A.	2 h (168 mA/mg) <sup>b</sup>	[19]

Reaction condition: <sup>a</sup> The mass activity of a CV curve after a certain cycles of accelerated durability test (ADT); <sup>b</sup> the mass activity after a certain time of chronoamperometry (CA) test; <sup>c</sup> the mass activity of a CV curve after a certain time of CA test.

**Table S2** Mass activity and stability of reported SACs in FAOR

Sample	Mass activity/(A·mg <sup>-1</sup> )	Stability	Ref.
SA-Rh/CN	16.1	44.5 h (16.1 A/mg) <sup>b</sup> 66.7 h (14.3 A/mg) <sup>b</sup>	[20]
Rh-SACs/HNCR	13.1	2.7 h (ca. 1.80 A/mg) <sup>c</sup>	[21]
SA-Ir/CN	12.9	10h (12.0 A/mg) <sup>b</sup>	[22]
IrN <sub>3</sub> O	20.0	40 h (20.0 A/mg) <sup>b</sup>	[23]
Pt <sub>1</sub> Au <sub>24</sub>	3.70	1000 cycles (3.97 A/mg) <sup>a</sup>	[24]
Pt <sub>4</sub> Au <sub>96</sub>	3.77	N.A.	[25]
Pt <sub>1</sub> /ATO	9.16	1800 cycles (48.7%) <sup>a</sup>	[26]

Reaction condition: <sup>a</sup> The mass activity of a CV curve after a certain cycles of accelerated durability test (ADT); <sup>b</sup> The mass activity of a CV curve after a certain time of CA test; <sup>c</sup> the mass activity after a certain time of CA test.

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