

Supporting Information

Copper-based integral catalytic impeller for rapid catalytic reduction of 4-nitrophenol

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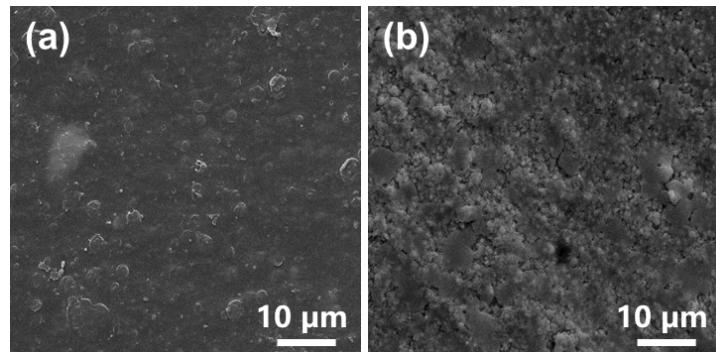


Figure S1. Results of copper plating after chemical coarsening. SEM images of (a) coarsened ABS by acetone and (b) Cu-ABS after acetone roughening.

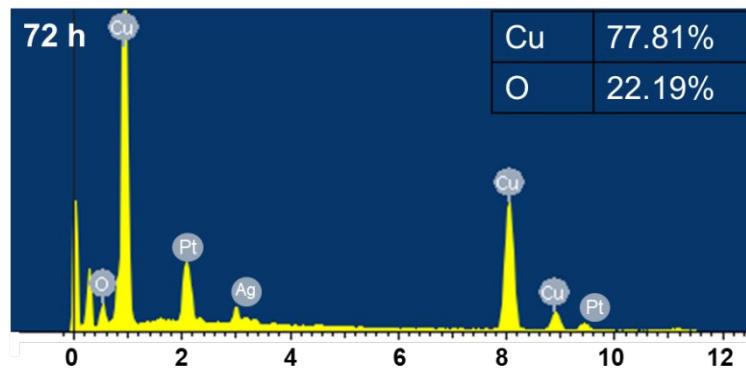


Figure S2. EDS spectrum of Cu-ABS sample over 72 h placement, the atomic ratio of Cu to O is close to 3.5:1.

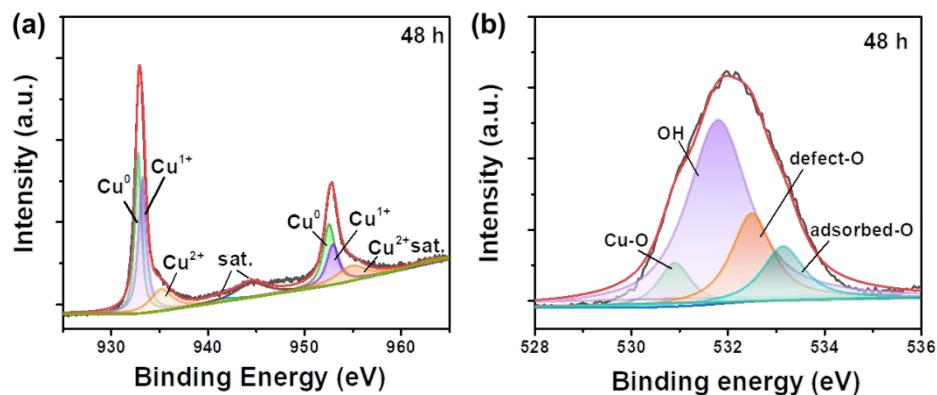


Figure S3. XPS spectra of Cu-ABS sample over 48 h placement. a) Cu 2p. b) O 1s.

Table S1. The calculated apparent rate constant (k_{app}) of Cu-ICAI catalyzed 4-NP in different reaction system.

Catalyst	numble of blades	Volume	k_{app}/min^{-1}	R^2
0 h	2	50	0.11	0.98711
48 h	2	50	0.22	0.93919
72 h	2	50	0.39	0.86922
96 h	2	50	0.31	0.96344
120h	2	50	0.15	0.97652
72h	4	50	1.3	0.99612
72h	6	50	4.37	0.93691
72h	6	100	2.64	0.86613
72h	6	150	0.6	0.96293

Table S2. The comparison of k_{app} and value with other copper based catalysts reported in the literature for the reduction of 4-NP.

Catalyst	C (mM)	V (mL)	k_{app} (min ⁻¹)	Con. (%)	Time (min)	Ref.
Cu-ICAI	0.2	50	4.37	100	1.5	This work
CuO_SiO ₂	0.16	300	3.607	99	4	8
Cu ₂ O/Cu-MOF/rGO	0.1	3	1.96	99	2	21
Cu ₂ O/Cu/SrTiO ₃	0.01	2.73	1.5	100	4	20
Cu/Cu ₂ O/rGO	1	50	0.978	100	6	19
Cu ₂ O–Cu–CuO	0.1	3	0.936	98	3	18
Cu NP(hollow porous)	0.1	2.5	0.558	100	6.5	3
Cu&Fe ₃ O ₄ -mC	2	100	0.237	95	30	40
Cu ₂ O-CTS	0.1	7	0.228	99	5	7
Cu ₁₆ Ag NW(core-shell)	1.2	5	0.216	100	8	10
Cu ₁ Au ₁ Nanoclusters	0.06	50	0.0178	42	30	9

Table S3. The price parameters for the preparation of small Cu-ICAI with 6 blades.

	Price (RMB)	Materials	Dosage	Reference price
Activated process	1.42	AgNO ₃	0.273 g	¥599/100 g
	2.73	C ₂ H ₅ OH	35 mL	¥39/500 mL
	0.69	CH ₂ ClCH ₂ Cl	5 mL	¥ 69/500 mL
Eletroless deposition	0.04	CuSO ₄	0.7 g	¥25/500 g
	0.34	NaKC ₄ H ₆ O ₆	2 g	¥89/500 g
	0.07	NaOH	0.45 g	¥79/500 g
Agitating impeller	0.03	HCHO	0.5 mL	¥23/500 mL
	0.07	raw ABS	2*2 cm ² *6	¥1.2/20*20cm ²
	0.35	AI frame(ABS)	8 g	¥22/500 g
Sum	¥5.74 (\$ 0.90)			