

Electronic supporting information

Selectively electrocatalytic CO₂ reduction to acetate on polymeric Cu-L (L=pyridinic N and carbonyl group) complex core-shell microspheres

Fei Guo,^a Bing Liu,^a Mengping Liu,^a Yu Xia,^a Tianlong Wang,^a Wei Hu,^a Lihong Tian^{a*},
Phoebe Fyffe,^b Xiaobo Chen^{b*}

^aHubei Collaborative Innovation Center for Advanced Organochemical Materials,
Ministry-of-Education Key Laboratory for the Synthesis and Applications of Organic
Functional Molecules, Hubei University, Wuhan 430062, P. R. China

^b Department of Chemistry, University of Missouri – Kansas City, Kansas City,
Missouri 64110, United States.

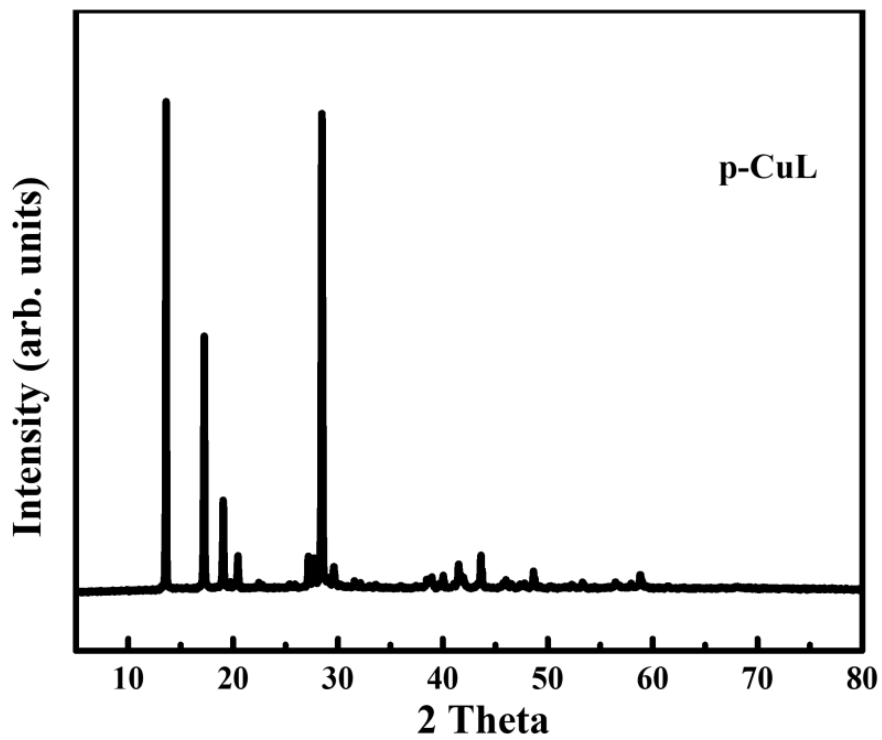


Fig. S1. The XRD pattern of p-CuL.

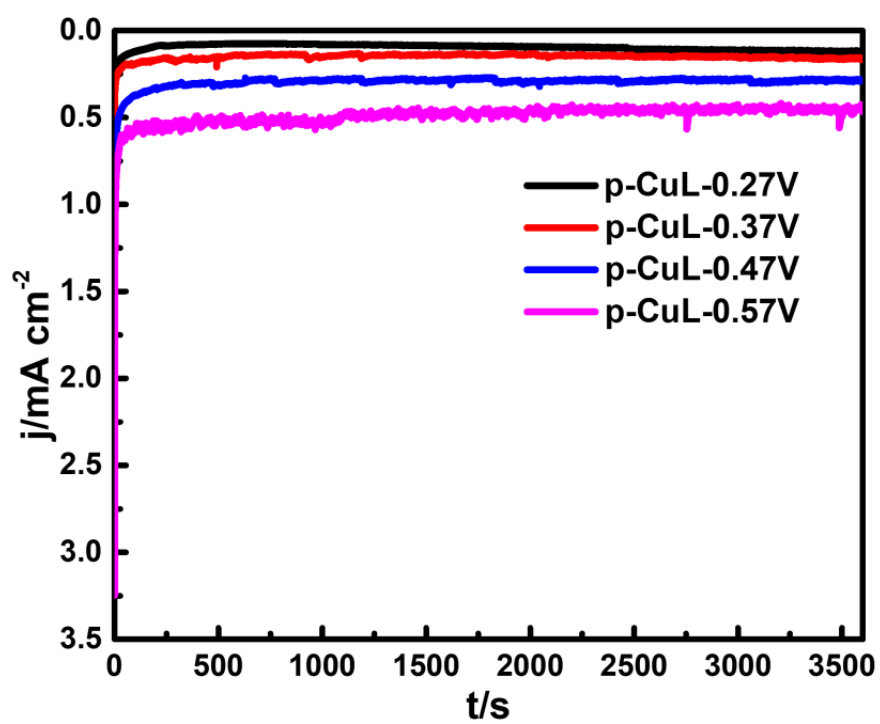


Fig. S2. Current variation in a 0.5M KHCO_3 CO_2 -saturated aqueous solution at potentials from -0.27V to -0.57V vs. RHE.

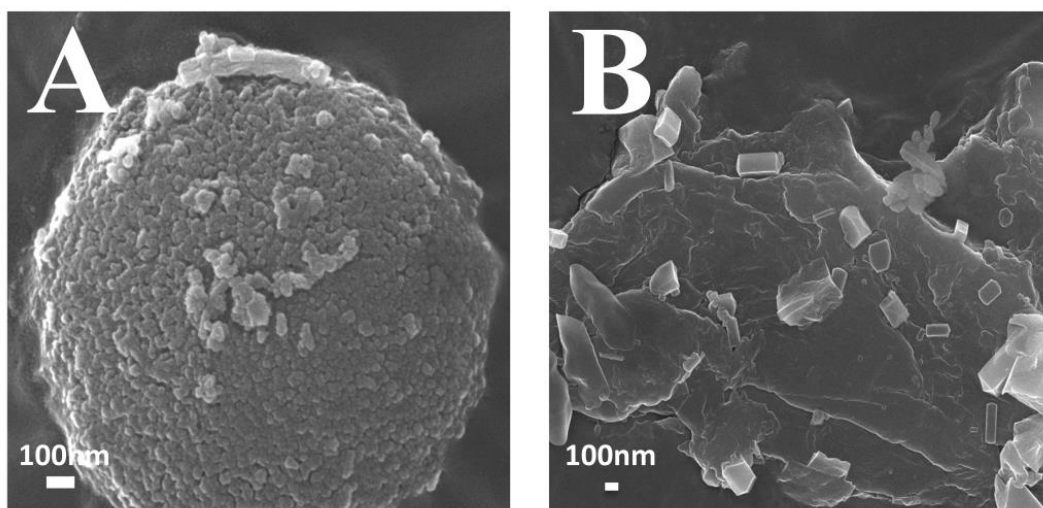


Fig. S3. FE-SEM graphs of p-CuL-6(A), p-CuL-8 (B).

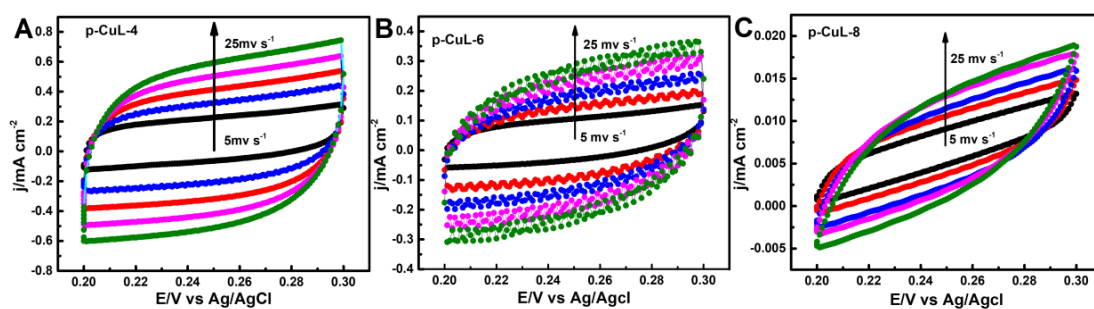


Fig. S4. Repeat the CV cycle at a scan rate of $5\text{-}25\text{mV}\cdot\text{s}^{-1}$ within the potential range of $0\text{-}0.3\text{V vs. Ag/AgCl}$ to measure the electrochemical double-layer capacitance (DLC) of p-CuL-4 (A), p-CuL-6 (B), p-CuL-8 (C).

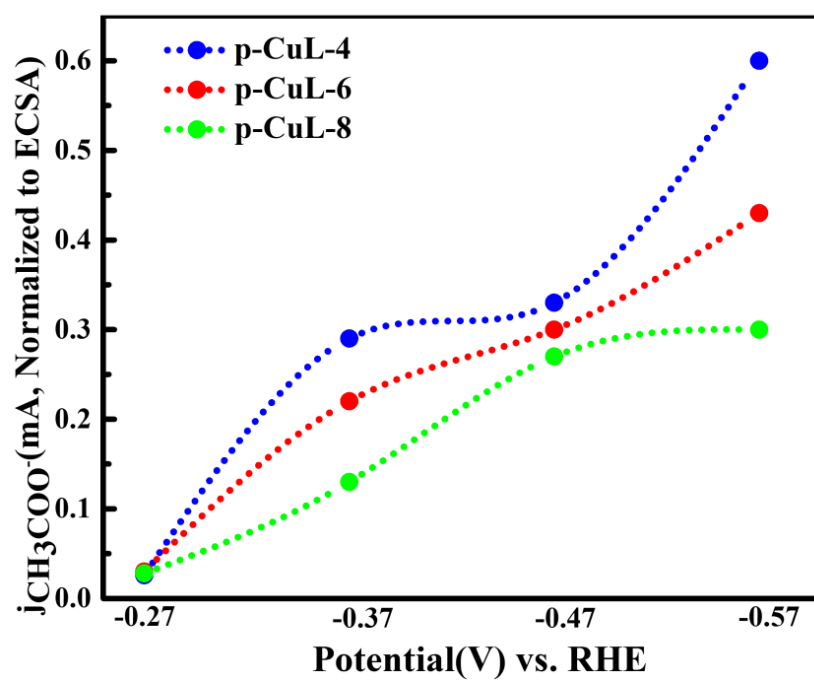


Fig. S5. j_{acetate} normalized to ECSA at same potentials among three catalysts.

Table S1. Progress in Carbon Dioxide Reduction on Copper-based Catalyst.

catalyst	Applied potential	Electrolyte	product	CH₃COO⁻ yield	Ref.
Cu ₂ (CuTCPP) nanosheets	-1.55 V vs. RHE	CH ₃ CN solution with 1 M H ₂ O and 0.5 M ionic liquid 1-ethyl-3-methylimidazolium tetrafluoroborate (EMIMBF ₄)	CH ₃ COO ⁻ CO CH ₄ HCOOH	FE=16.8%	Chem Sci, 2019,10: 2199–2205
Cu ₁₀ -CNT	-1.4 V vs. RHE	0.5 M KHCO ₃	CH ₃ COO ⁻ HCOOH CH ₃ OH	TOF=208.7 (μmolh ⁻¹ g _{Cu} ⁻¹)	Green Chem, 2017,19: 2406-2415
Fe-Cu Mixed Oxide	-0.4 V vs. Ag/AgCl (Photo-electrocatalysis)	0.1 M NaHCO ₃	CH ₃ COO ⁻	FE=80%	ACS Catal. 2017,7(1): 177–180
(Cu) _n ,(Ag) _m	-1.33 V vs. RHE	0.5 M KHCO ₃	CH ₃ COO ⁻ CO CH ₄ HCOOH	FE=21.2%	PNAS 2018, 115(2): 278-283
Cu-CeO ₂	-1.8 V vs. RHE	0.1 M KHCO ₃	CH ₄ C ₂ H ₄ CH ₃ COOH HCOOH CO CH ₃ OH	FE=5%	ACS Catal. 2018,8(8): 7113–7119

Table S2. The content of each element in the catalyst.

catalyst	ICP-AES	Elemental analysis (wt%)			
	Cu	N	C	H	O
p-CuL-4	21.0wt%	28.6	20.3	2.9	21.0
p-CuL-6	21.0wt%	28.6	20.1	2.9	22.1
p-CuL-8	20.0wt%	28.9	20.3	2.9	22.0