

Effect of the Cu^{2+/1+} Redox Potential of Non-Macrocyclic Cu Complexes on Electrochemical CO₂ Reduction

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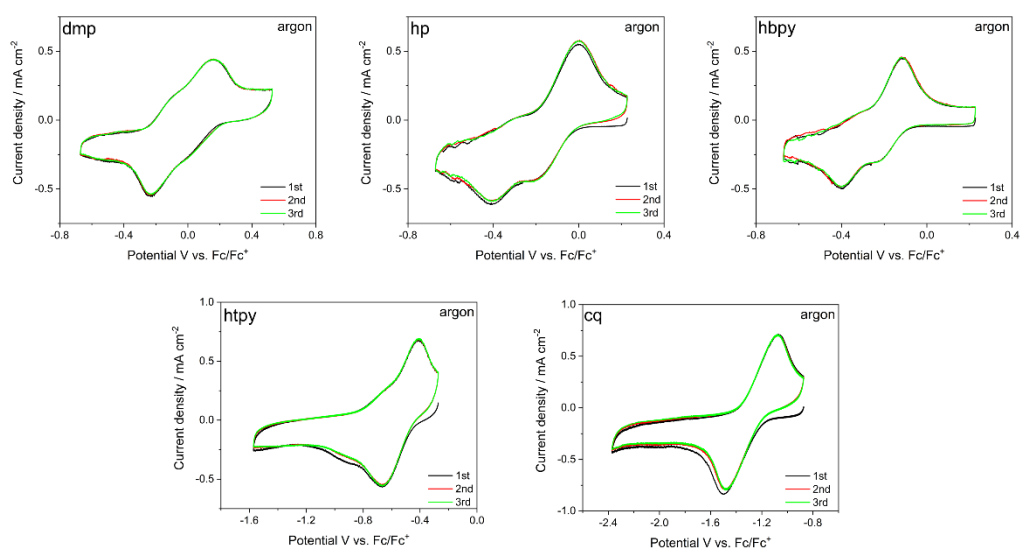


Figure S1. Three cycles of CV curves of five Cu complexes in argon

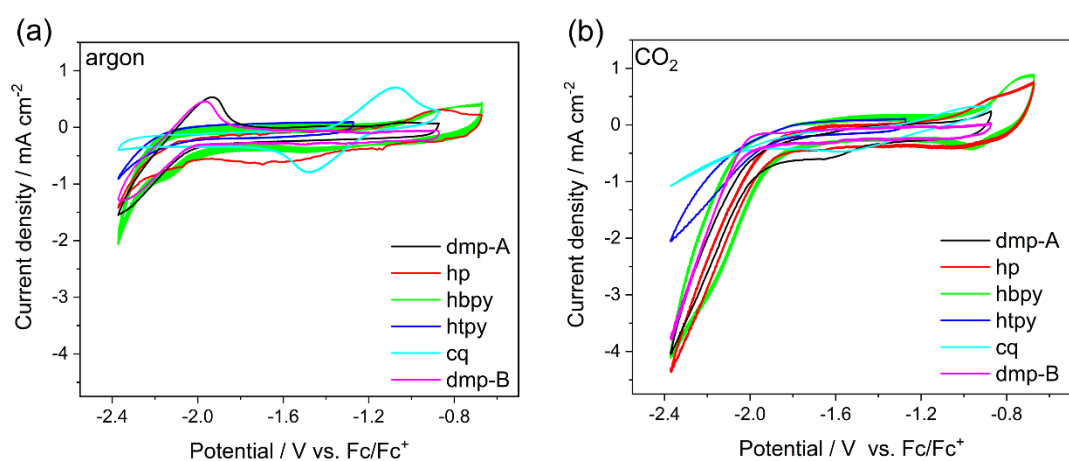


Figure S2. CVs of Cu complexes dissolved in 0.1 M TBAP/DMF electrolyte with 0.1 M water in argon (a) and CO₂ (b)

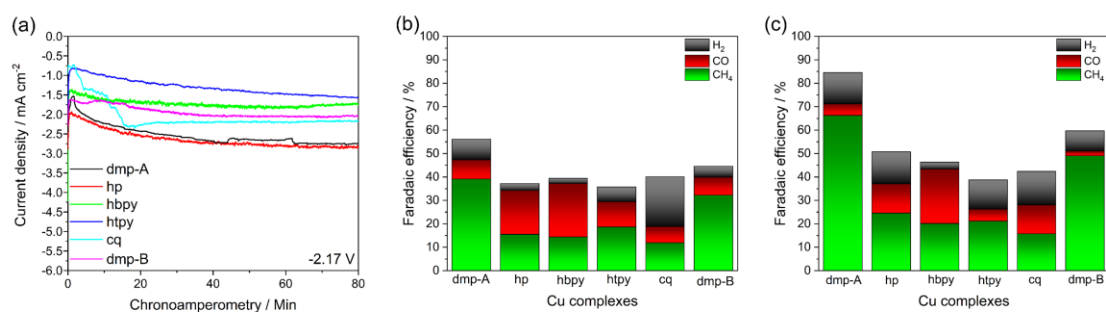


Figure S3. (a) CA at -2.17 V vs. Fc/Fc⁺, (b) the FE of gas products at 20 min of CA and (c) FE of gas products at 80 min of CA

Electrode	Electrolyte	Atmosphere	H ₂ (ppm) at -2.17 V
Carbon paper	0.1 M TBAP/DMF + 0.1 M water	CO ₂	10.9
Carbon paper	0.1 M TBAP/DMF + 0.1 M water + 1 mM cq complex	CO ₂	342

Table S1. The amount of H₂ produced using carbon paper with and without *cq* complex in the electrolytes during CA at -2.17 V vs. Fc/Fc⁺

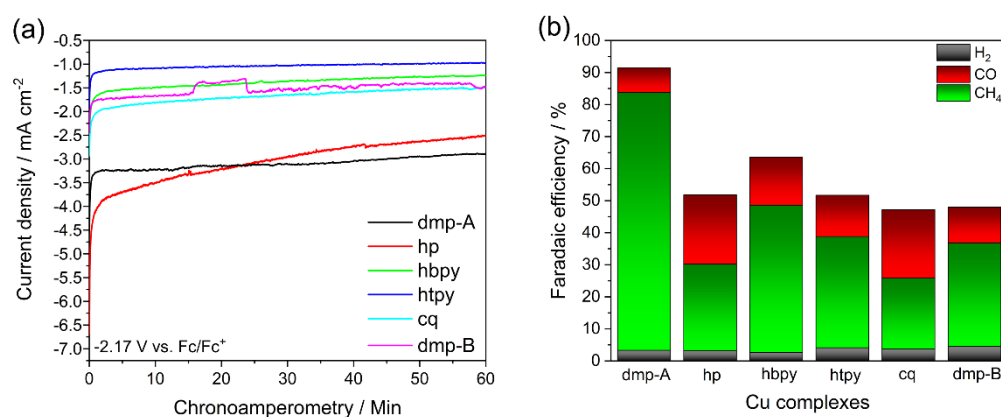


Figure S4. (a) CA in purely heterogeneous mechanism at -2.17 V vs. Fc/Fc⁺, (b) FE of gas products at 60 min of CA

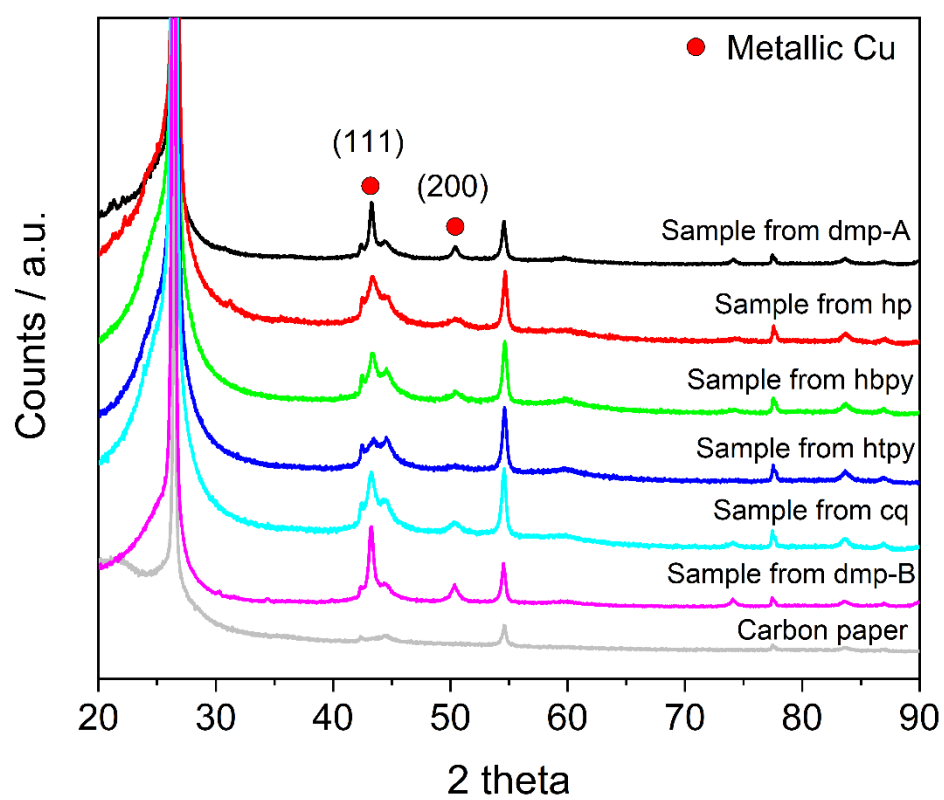


Figure S5. XRD patterns of carbon paper and Cu-complex-derived catalysts after CA.

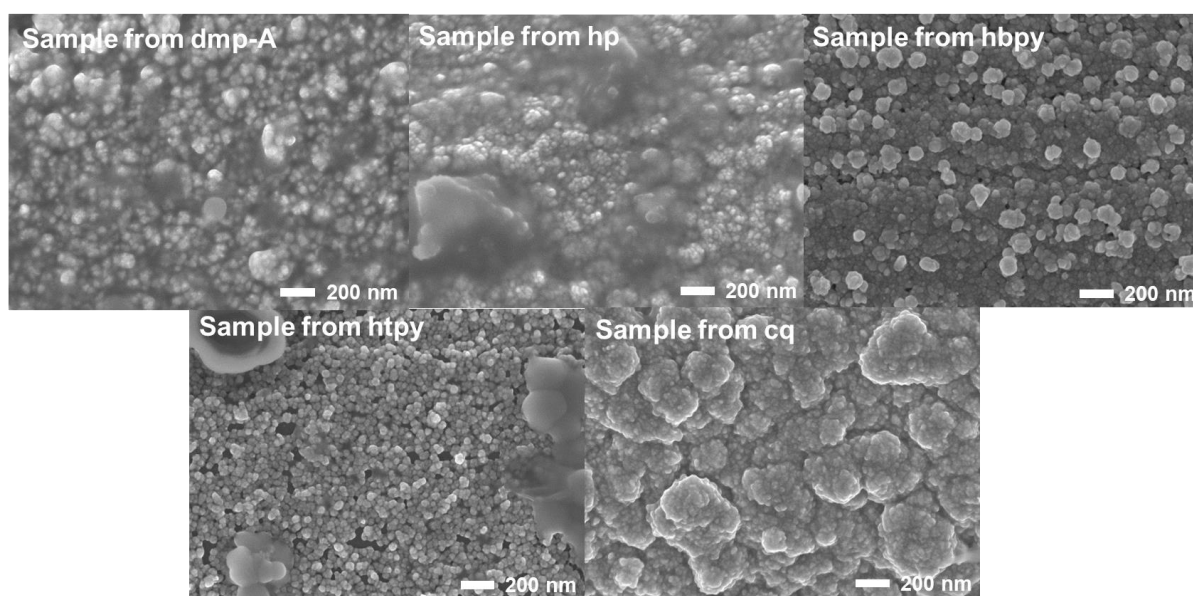


Figure S6. SEM images of Cu-complex-derived catalysts after CA

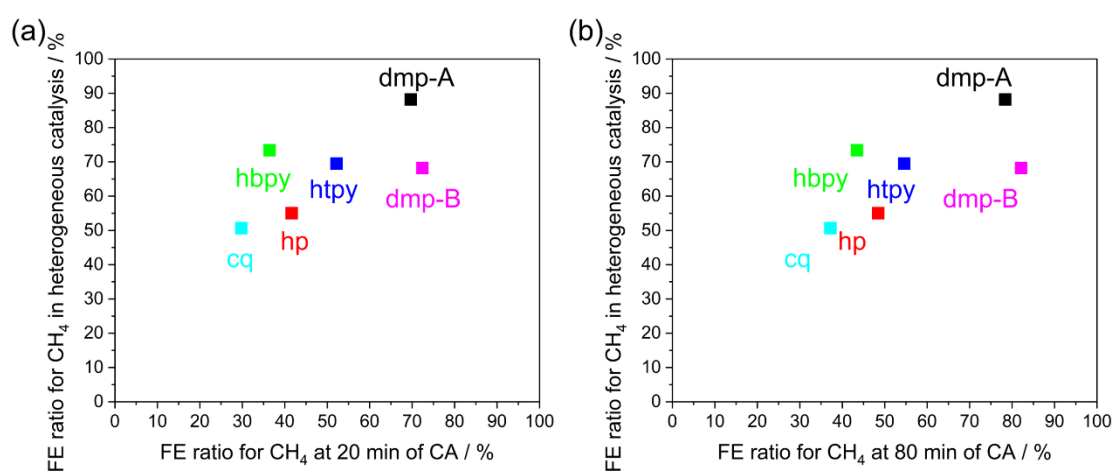


Figure S7. FE ratio for CH_4 in heterogeneous catalysis versus at 20 min (a) and at 80 min (b) of CA in the Cu complex dissolved electrolyte

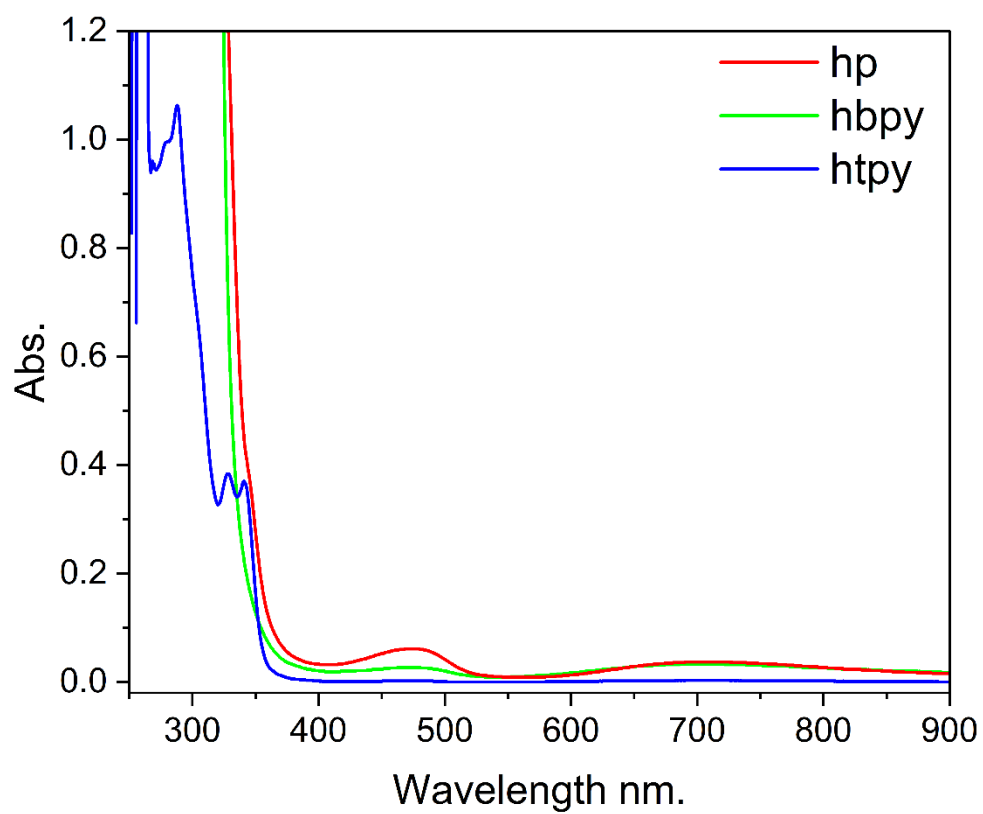


Figure S8. UV-vis spectra of Cu complexes synthesized using the HETPHEN strategy

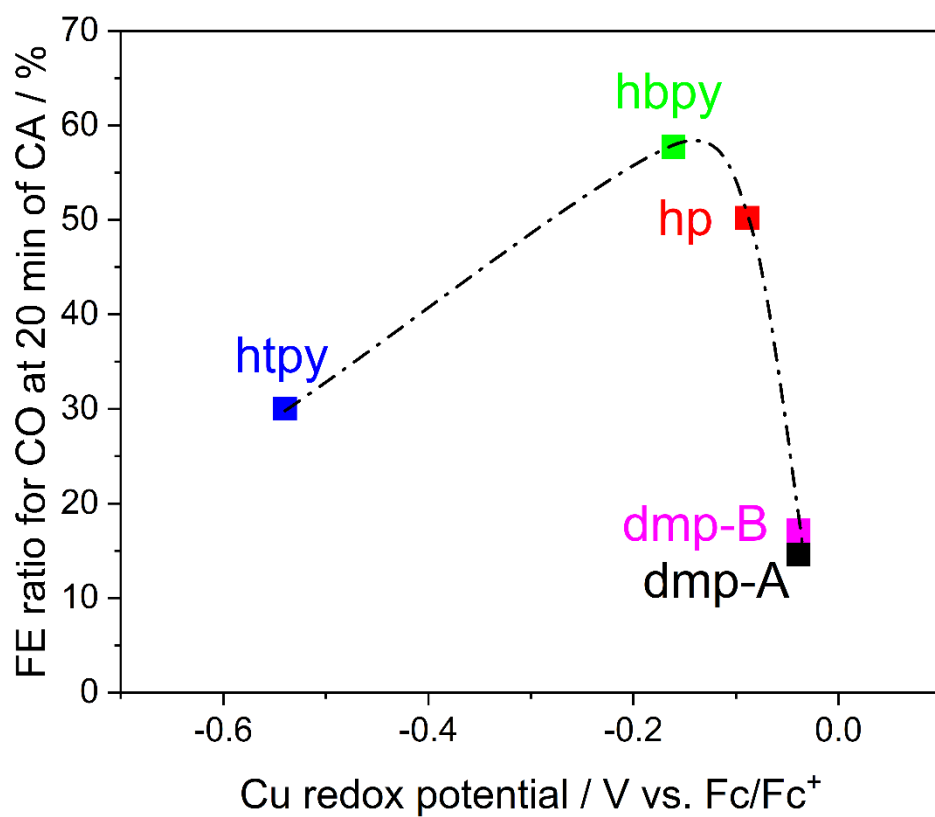


Figure S9. The Cu redox potential in argon (excluding *cq* complex) versus the Faradaic efficiency ratio of CO at 20 min of CA at -2.17 V vs. Fc/Fc⁺

Cu-complex-derived catalyst	Potential range (V vs. Fc/Fc⁺)	Potential window (ΔV)	Specific capacitance (F/g)
Sample from dmp-A	-1.2~-1.0	0.2	0.56
Sample from hp	-	-	-
Sample from hbpy	-1.6~-1.4	0.2	0.80
Sample from htpy	-1.6~-1.4	0.2	0.45
Sample from cq	-1.2~-1.0	0.2	0.65
Sample from dmp-B	-1.2~-1.0	0.2	0.43

Table S2. Specific capacitance of the Cu-complex-derived catalysts

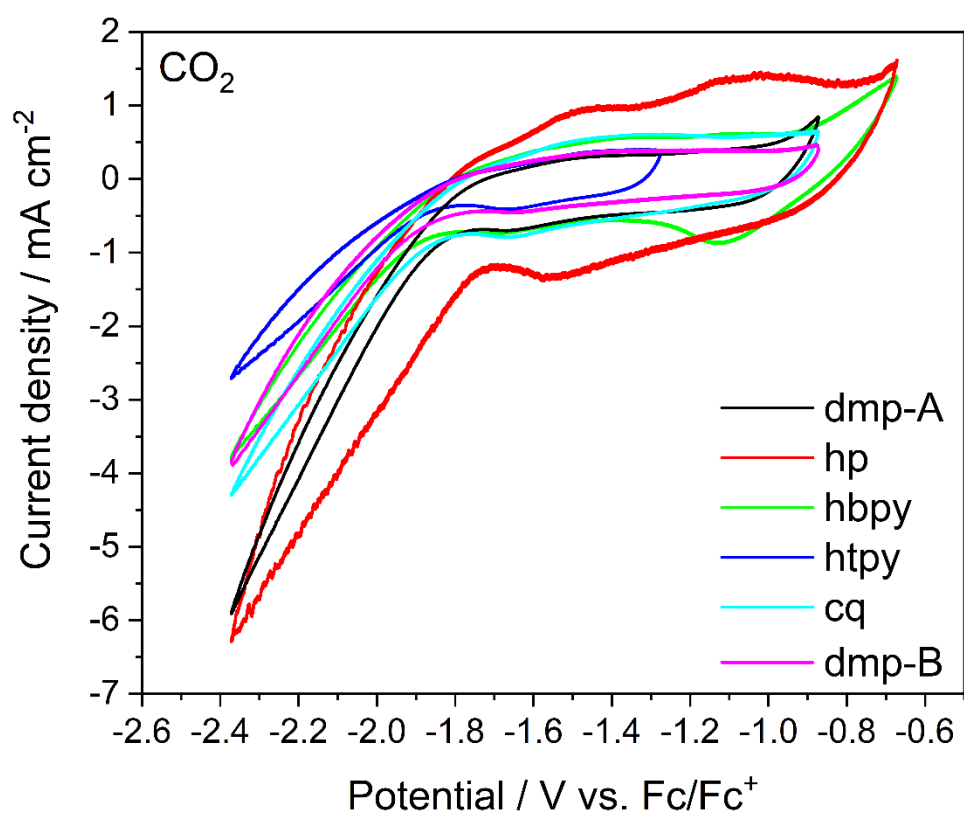


Figure S10. CVs of the Cu-complex-derived catalysts in CO_2

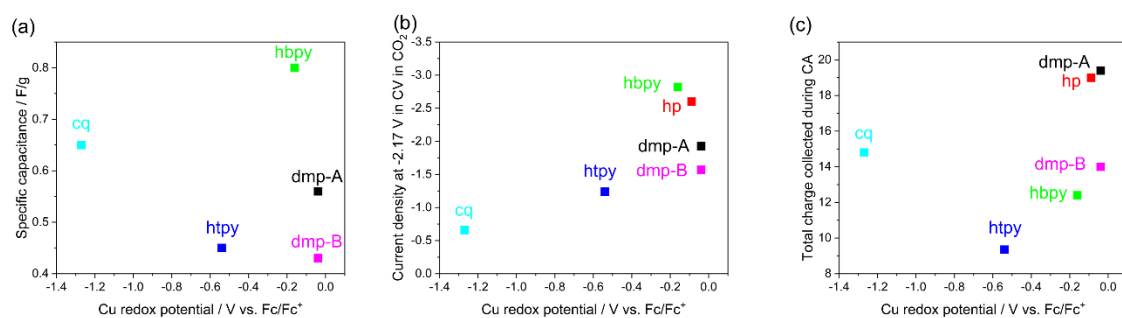


Figure S11. The Cu redox potential in argon versus specific capacitance (F/g) (a) and current density at -2.17 V in CV under CO_2 (b) and total charge collected during CA (c)