Electronic Supplementary Material (ESI) for Nanoscale.

Tandem Effect of Atomically Isolated Copper–Nitrogen Sites and Copper Clusters Enhances CO_2 Electroreduction to Ethylene

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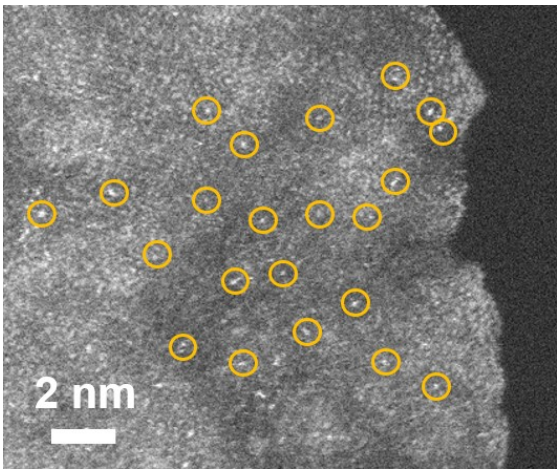

Figure S1. STEM image of PDI-Cu

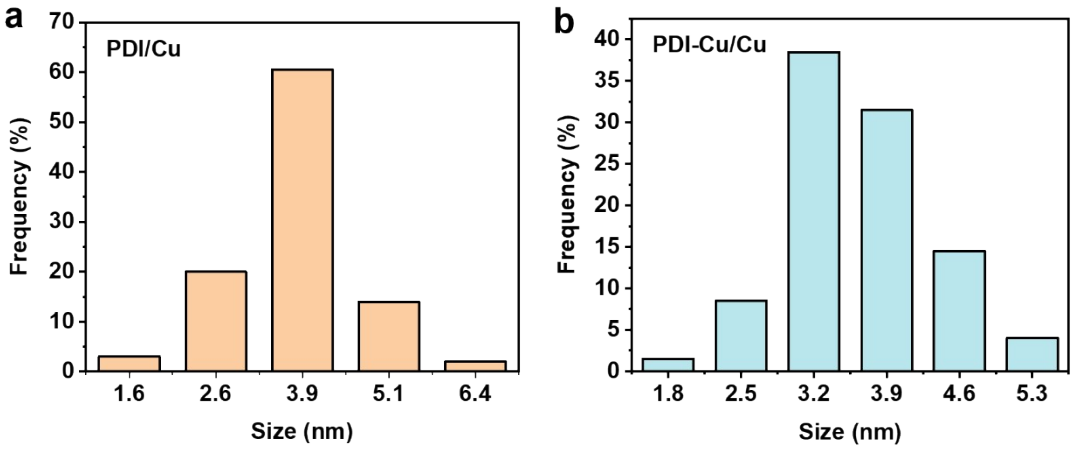

Figure S2. size distribution of Cu clusters on (a) PDI/Cu and (b) PDI-Cu/Cu.

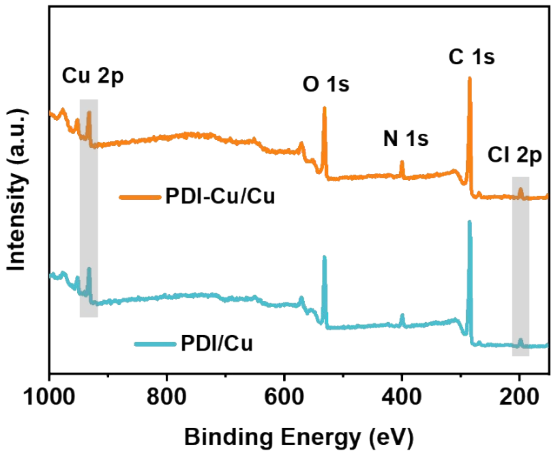

Figure S3. The full XPS survey spectra.

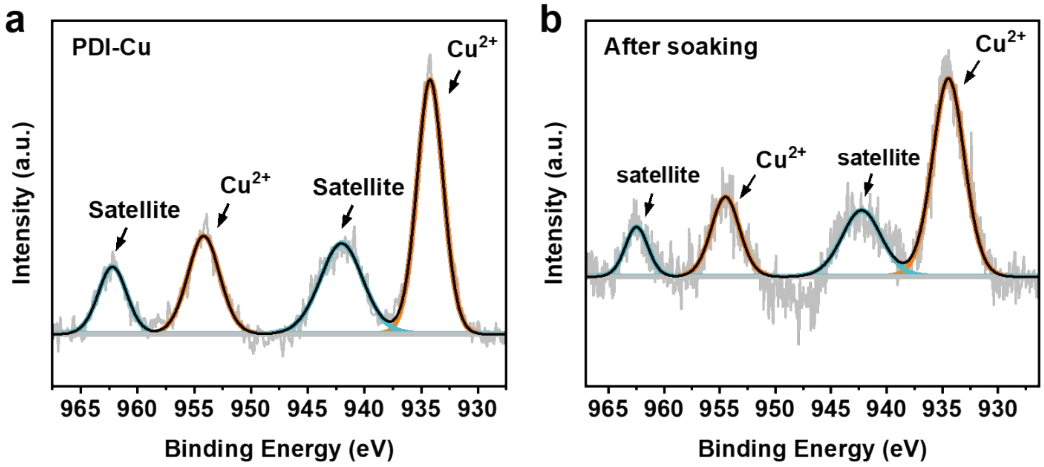

Figure S4. Cu 2p XPS spectra of (a) PDI-Cu and (b) PDI-Cu after soaking *L*-ascorbic acid.

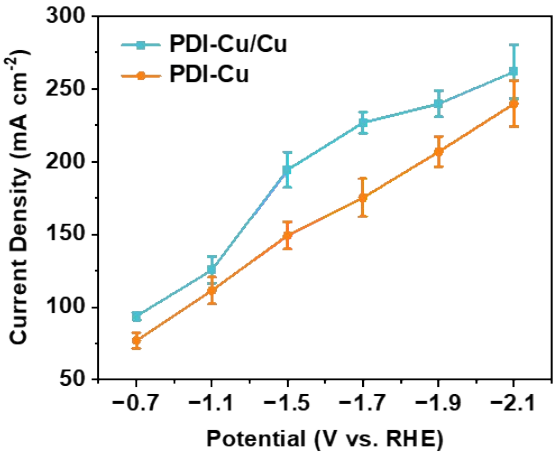

Figure S5. Total current densities of PDI-Cu/Cu and PDI/Cu.

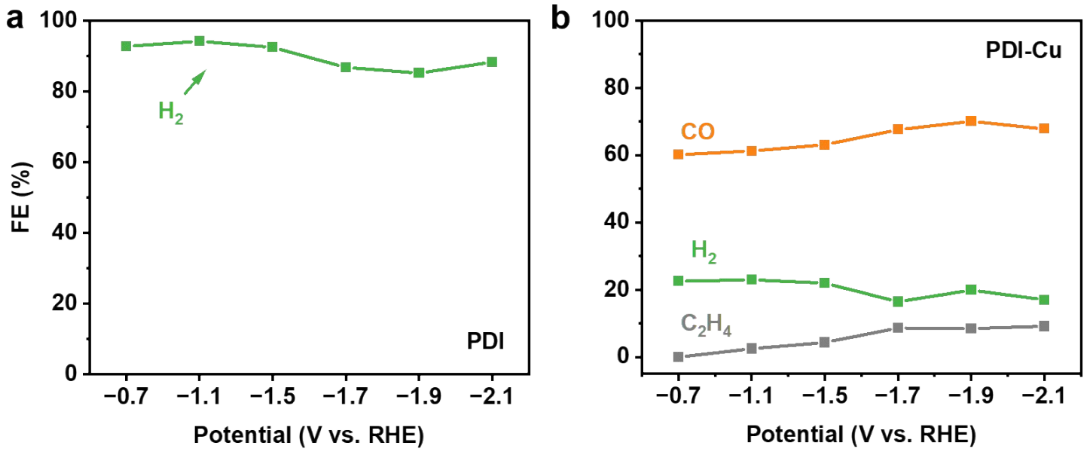

Figure S6. FEs of different products for (a)PDI and (b) PDI-Cu.

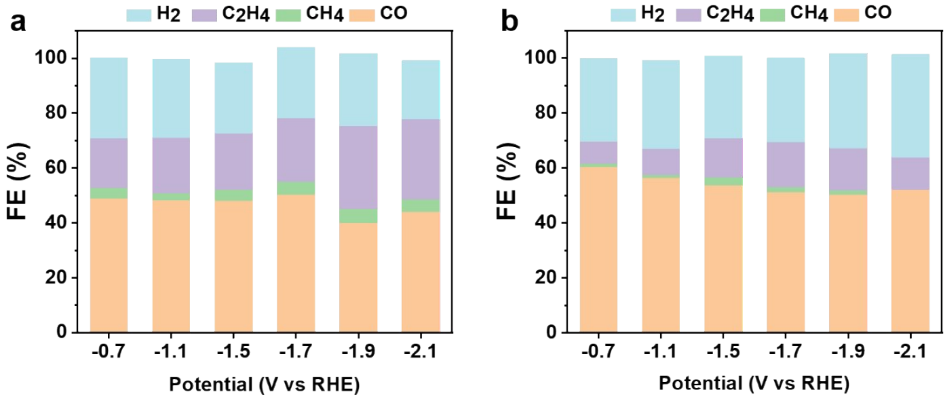

Figure S7. FEs of CO2RR products at different applied potentials (V vs. RHE) catalyzed by (a)PDI-Cu/Cu and (b) PDI/Cu.

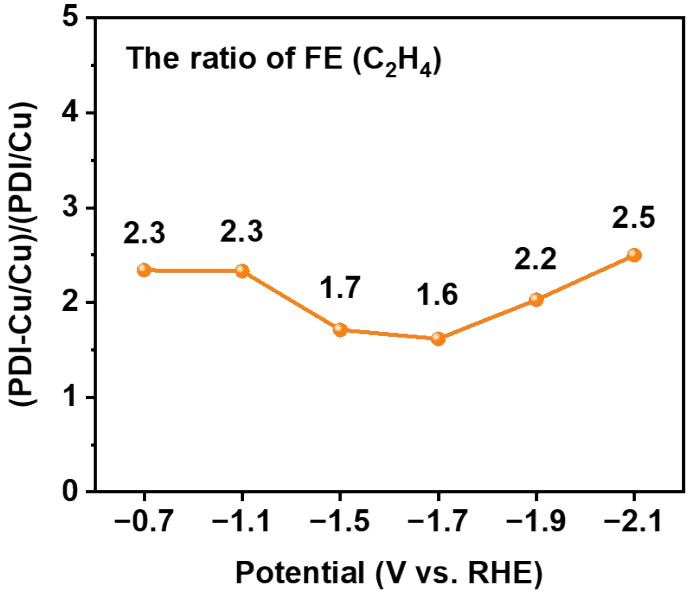

Figure S8. The FE (C_2H_4) ratio of PDI-Cu/Cu to PDI/Cu.

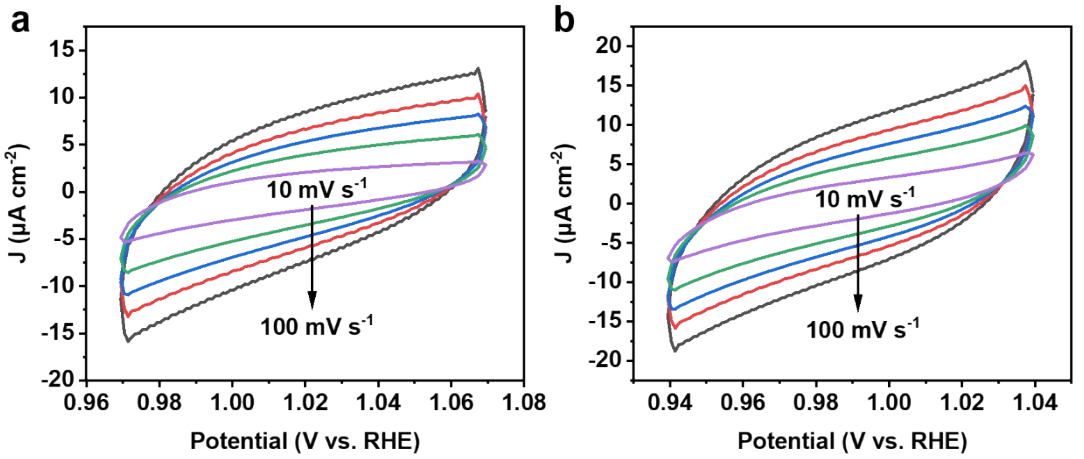

Figure S9. Typical cyclic voltammograms of (a) PDI-Cu/Cu and (b) PDI/Cu at different scan rate.

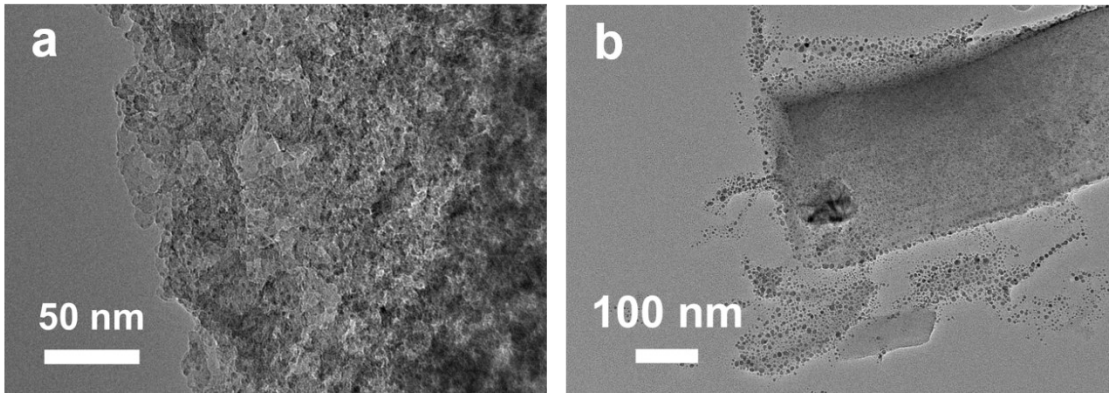

Figure S10. The TEM images of (a) PDI-Cu/Cu and (b) PDI/Cu after the electrochemical CO_2RR.

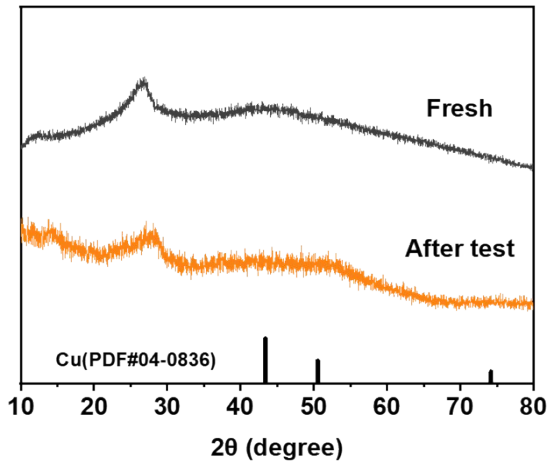

Figure S11. XRD patterns of before and after electrochemical CO_2RR of PDI-Cu.

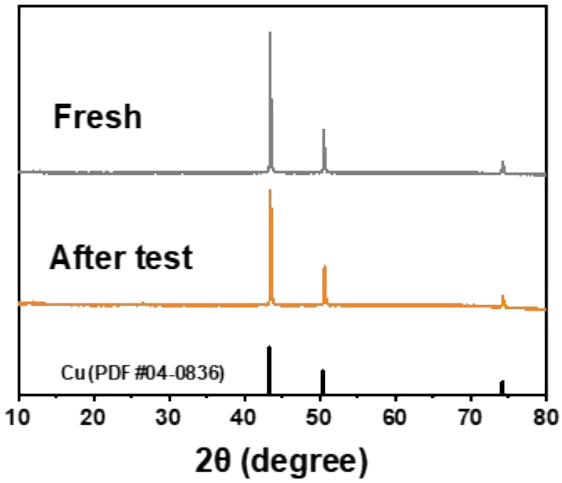

Figure S12. XRD patterns of before and after electrochemical CO_2RR of PDI-Cu/Cu.

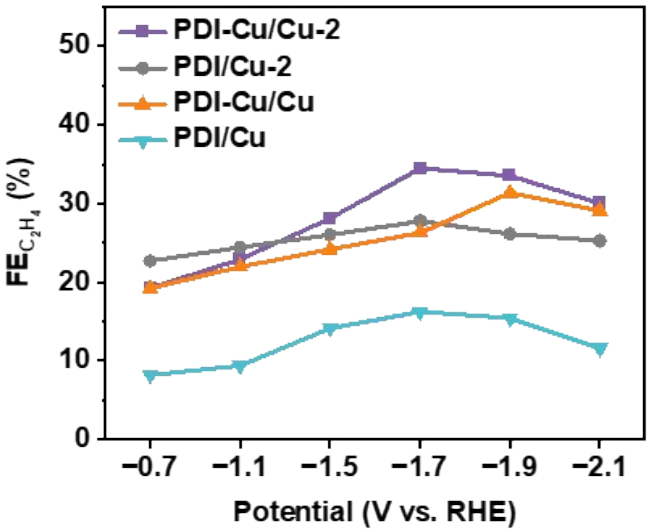

Figure S13. The FEs for C_2H_4 conversion catalyzed by PDI-Cu/Cu, PDI-Cu, PDI-Cu/Cu-2 and PDI/Cu-2.

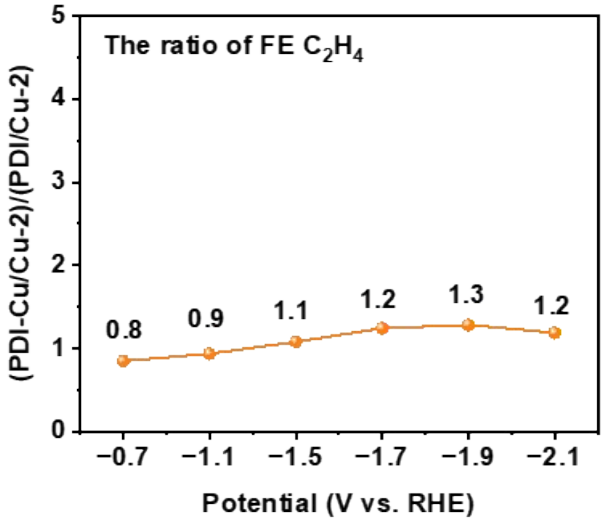

Figure S14. The FE (C_2H_4) ratio of PDI-Cu/Cu-2 to PDI/Cu-2.

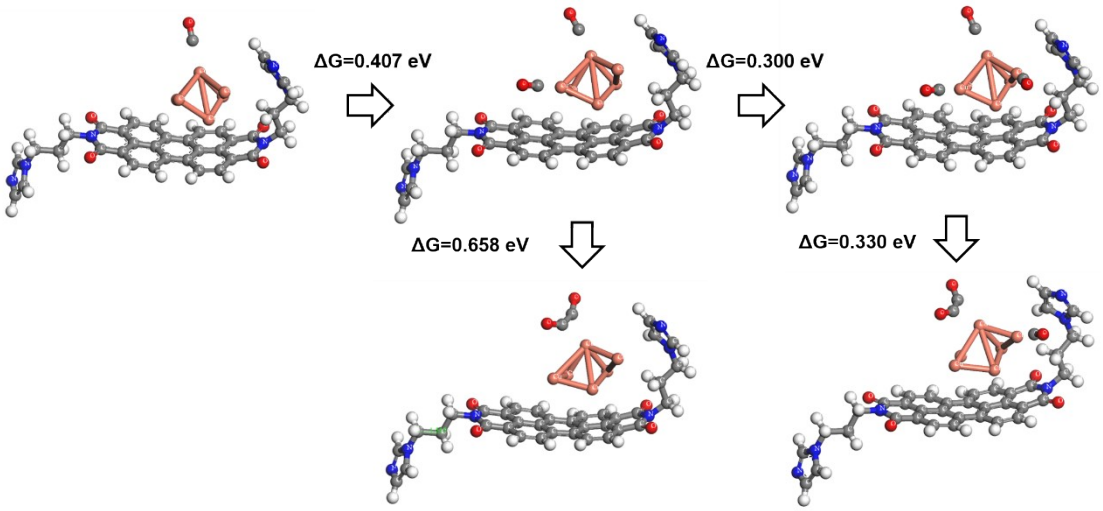

Figure S15. The complete structures of CO adsorption and C-C coupling on Cu clusters.

Table S1. The ICP results of the PDI-Cu, PDI-Cu/Cu and PDI/Cu samples.

	PDI-Cu	**PDI-Cu/Cu**	**PDI/Cu**
Content of Cu (wt%)	7.70	46.3	40.2

Table S2. The EXAFS curve-fitting results of the PDI-Cu samples.

Sample	**Path**	**CN**	**R (Å)**	**σ^2 (10^{-3} Å^2)**
PDI-Cu	Cu-N	2.0(±0.2)	1.95(±0.01)	0.7(±0.1)
	Cu-Cl	2.0(±0.1)	2.30(±0.02)	1.2(±0.1)

Table S3. The ICP results of the PDI-Cu/Cu-2 and PDI/Cu-2 samples.

	PDI-Cu/Cu-2	**PDI/Cu-2**
Content of Cu (wt%)	74.7	84.2