Supporting Information

CO_2 Electroreduction by Engineering the Cu_2O/RGO Interphase

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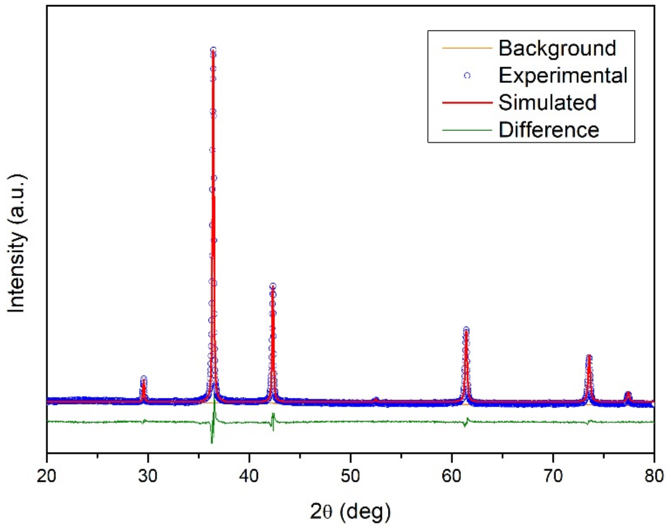


Figure S1: Rietveld analysis of the CU Cu_2O/RGO 2:1 diffractogram.

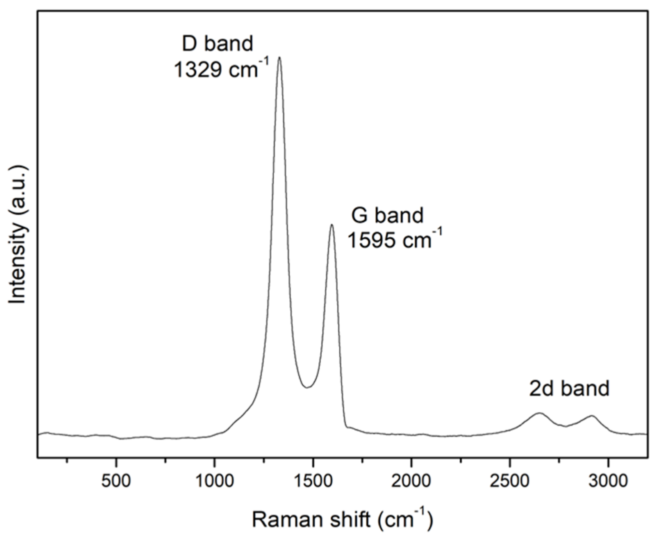


Figure S2: Raman Spectrum of pure RGO with the characteristics vibrations.

Table S1: Weight fraction of the different CU Cu_2O/RGO materials from TGA analysis.

Material	$\%_{Cu_2O,\ theoretical}$	$\%_{Cu_2O,\ TGA}$
CU Cu_2O/RGO 2:1	66.7%	66.0%
CU Cu_2O/RGO 1:1	50.0%	46.3%
CU Cu_2O/RGO 1:2	33.3%	21.3%

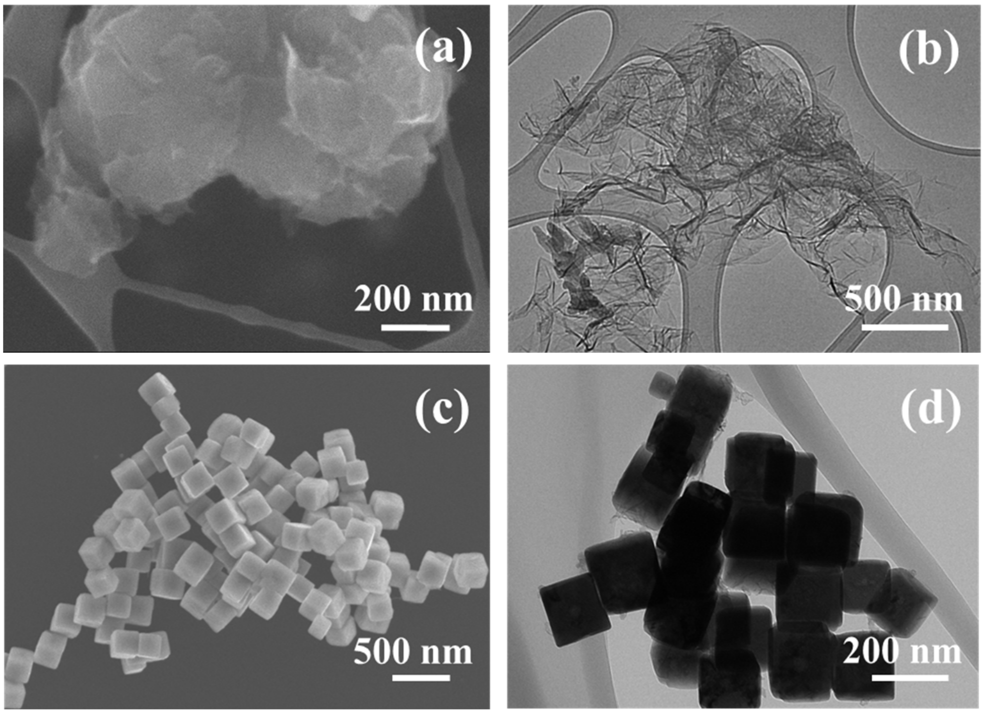


Figure S3: (a) SEM and (b) TEM images of pristine RGO. (c) SEM and (d) TEM images of pristine CU Cu_2O.

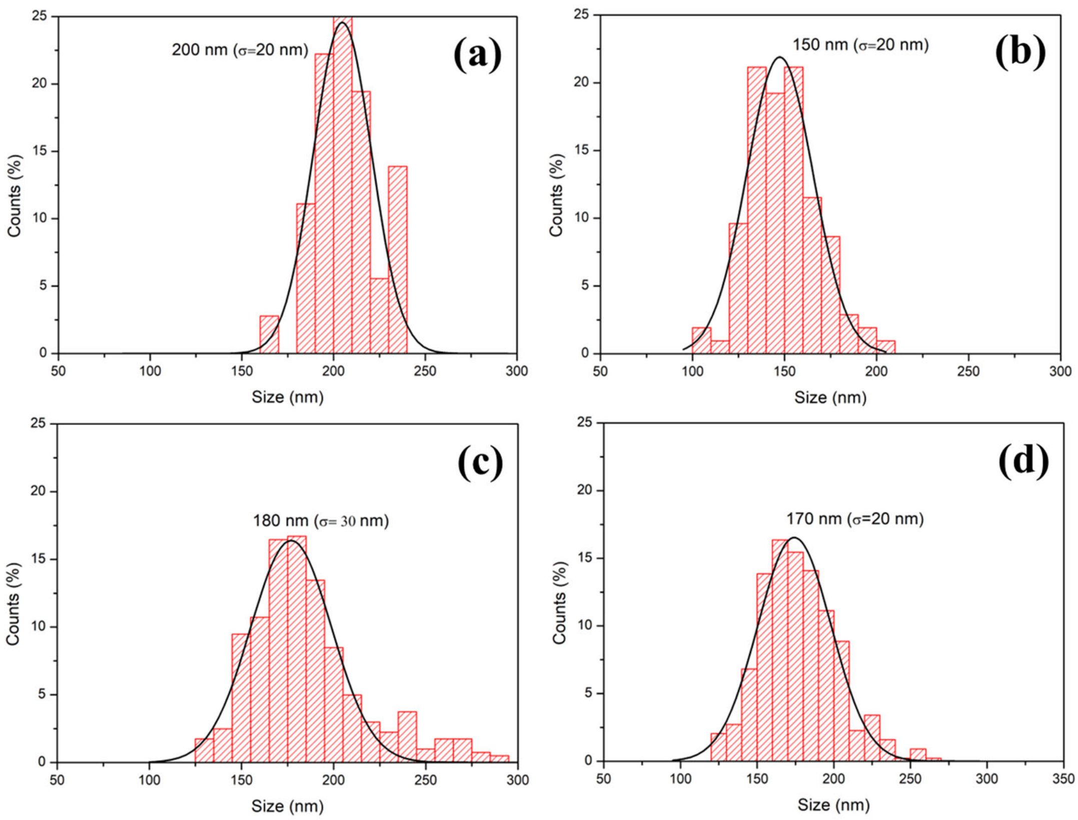


Figure S4: Sizes distribution for the different materials (count: 400 particles). (a) CU Cu_2O. (b) CU Cu_2O/RGO 2:1. (c) CU Cu_2O/RGO 1:1. (d) CU Cu_2O/RGO 1:2.

Table S2: Size of Cu_2O nanoparticles on the different materials.

Material	Cu_2O size (nm)	σ (nm)
Cu Cu_2O	200	20
CU Cu_2O/RGO 2:1	150	20
CU Cu_2O/RGO 1:1	180	30
CU Cu_2O/RGO 1:2	170	20

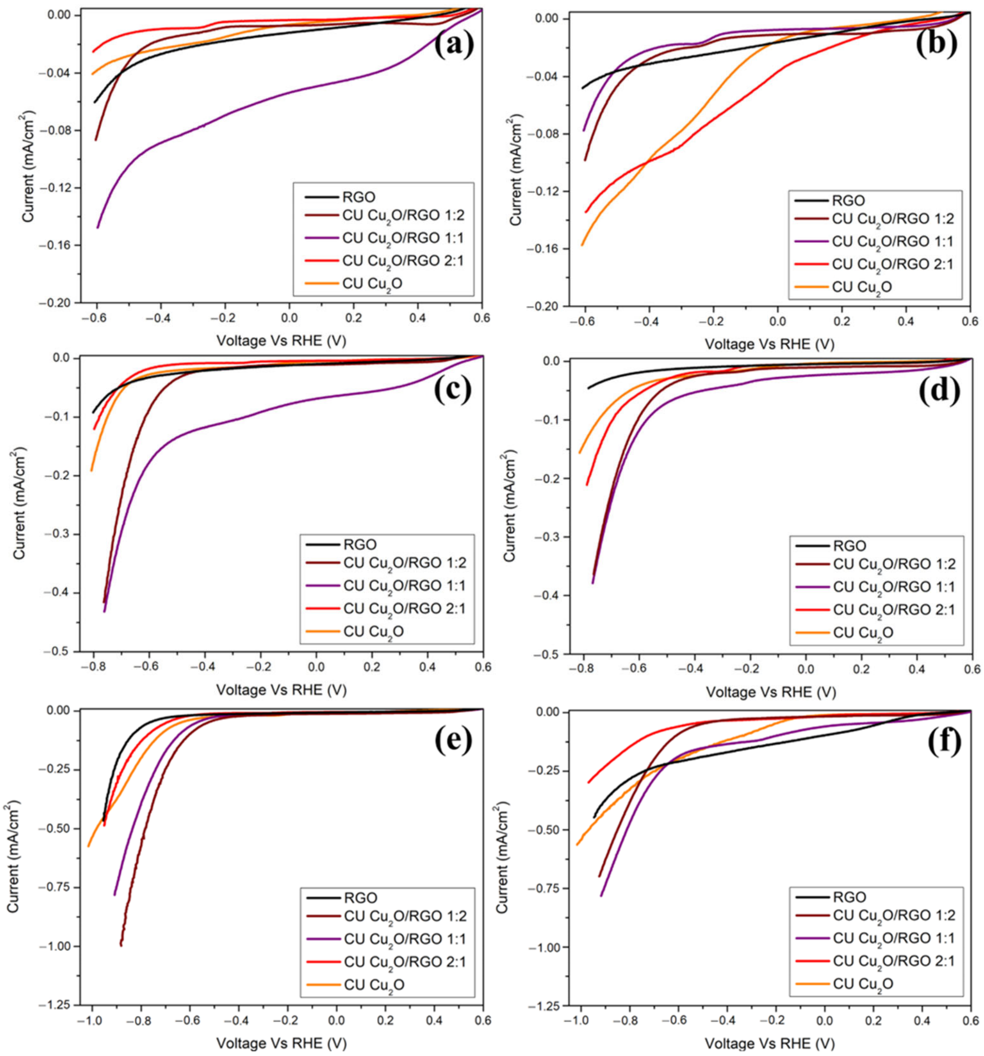


Figure S5: Linear sweep voltammetries at -0.6 V (a and b), -0.8 V (c and d) and -1.0 V (e and f) for the different materials. The measures on the left (a, c and e) were performed in Ar while the measures on the right (b, d and f) were performed in CO_2 atmosphere. All the voltages are vs RHE and corrected with iR compensation.

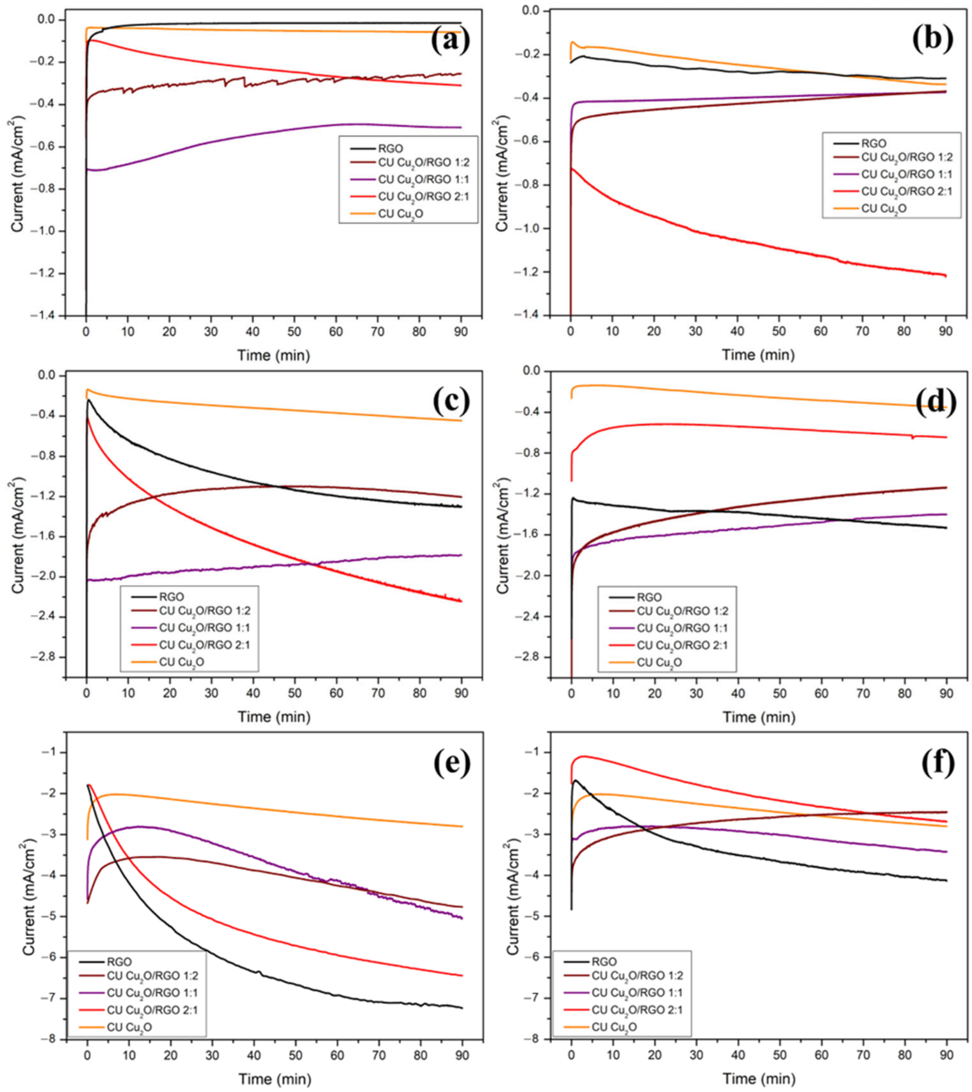
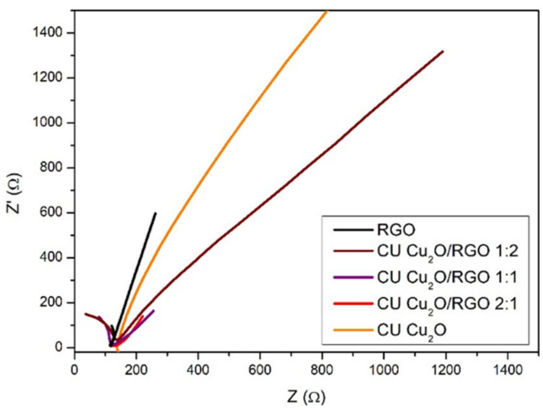


Figure S6: Chronoamperometries at -0.6 V (a and b), -0.8 V (c and d) and -1.0 V (e and f) for the different materials. The measures on the left (a, c and e) were performed in Ar while the measures on the right (b, d and f) were performed in CO_2 atmosphere. All the voltages are vs RHE and corrected with iR compensation.



(a)

(b)

Material	$R_{el}(\Omega)$	$R_P(\Omega)$
Cu Cu_2O	142	738
CU Cu_2O/RGO 2:1	140	234
CU Cu_2O/RGO 1:1	128	23
CU Cu_2O/RGO 1:2	116	34
RGO	118	99

Figure S7: A) Nyquist plot at OCV of the different materials performed in CO_2 saturated atmosphere. B) R_{el} (electrical resistance) and R_P (polarization resistance) values extrapolated from the simulation of (a) in the frequency range 1000-5000 Hz with a Randle circuit.

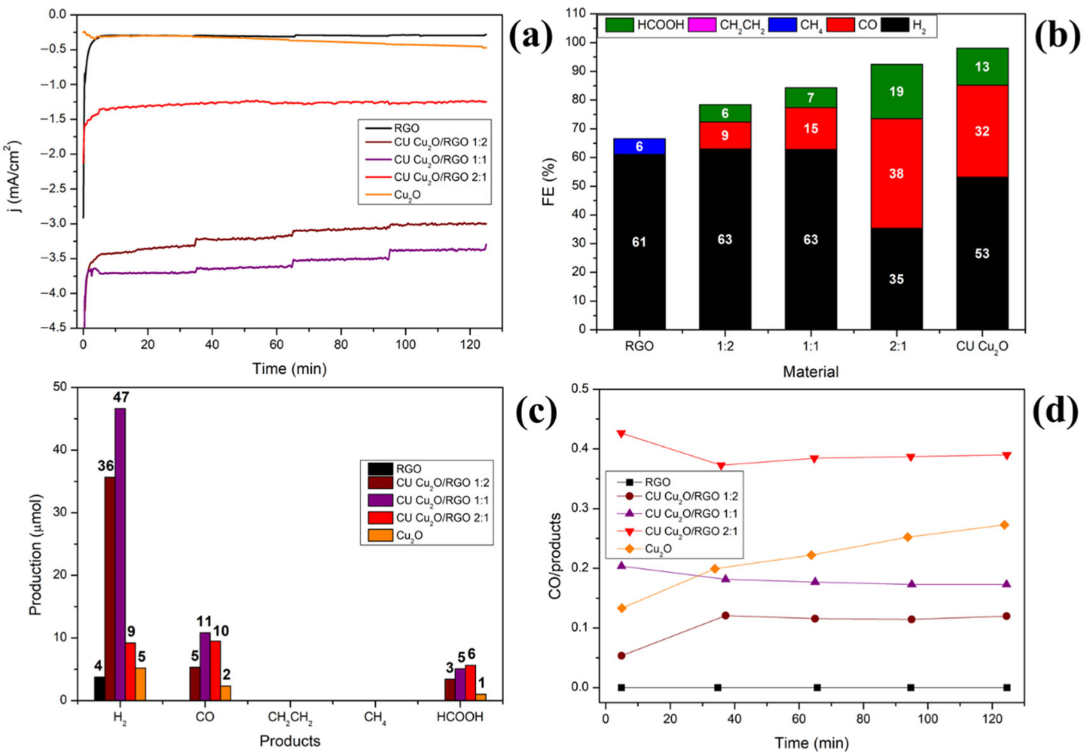


Figure S8: CO_2RR tests for the different composites of CU Cu_2O/RGO at the voltage of −0.7 V vs. RHE. (**a**) Two hour chronoamperometries under saturated CO_2 atmosphere. (**b**) FEs of gaseous and liquid products. (**c**) Products distribution (mmol) of the different compounds after 2 hour chronoamperometries. (**d**) Production profile of CO during the experiment for the different composite materials.

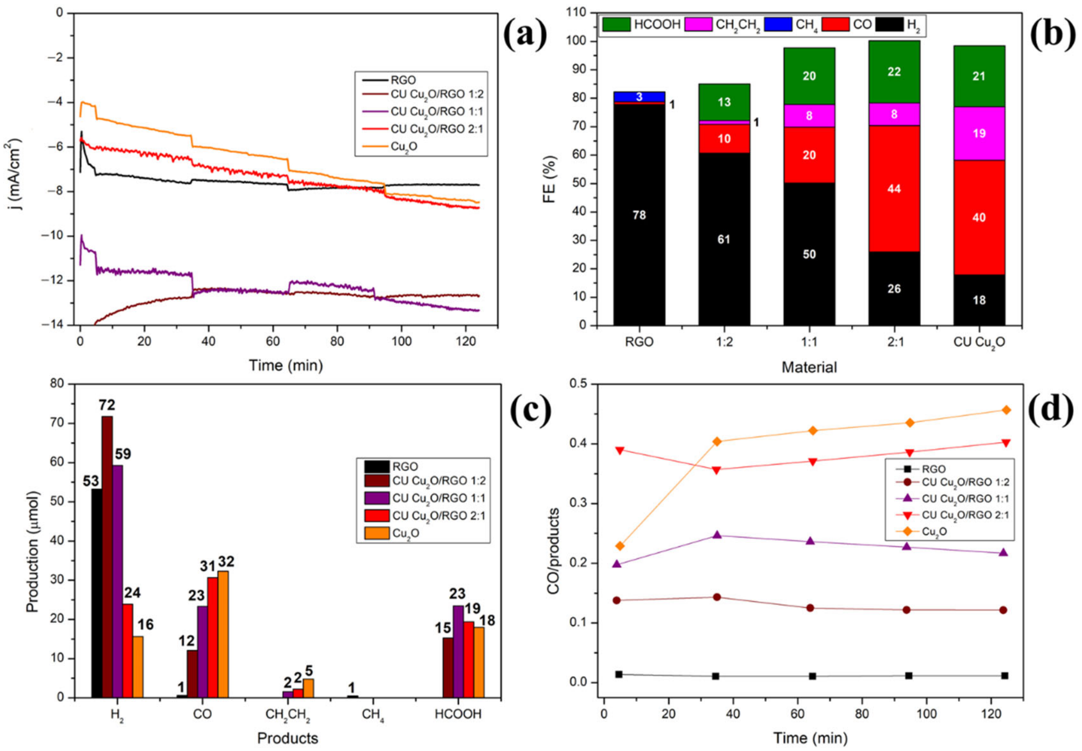


Figure S9: CO_2RR tests for the different composites of CU Cu_2O/RGO at the voltage of −1.1 V vs. RHE. (**a**) Two hour chronoamperometries under saturated CO_2 atmosphere. (**b**) FEs of gaseous and liquid products. (**c**) Products distribution (mmol) of the different compounds after 2 hour chronoamperometries. (**d**) Production profile of CO during the experiment for the different composite materials.

Table S3: Comparison with the literature.

Material	Voltage	Main CO_2RR product (at the considered voltage)	Reference
CU Cu_2O/RGO 2:1	-0.9 V vs RHE	CO (FE: 50%)	This work
Cu on RGO	-0.7 V vs RHE	CO (FE: 20%)	[1]
CU Cu_2O/N-doped RGO	-1.1 V vs RHE	CO (FE: ≈10%)	[2]
CoTMPyP on RGO	-0.7 V vs RHE	CO (FE: 45%)	[3]
R-ZnO/RGO	-0.7 V vs RHE	CO (FE: ≈70%)	[4]
Bi-RGO	-0.75 V vs RHE	$HCOO^-$ (FE: 60%)	[5]

Table S4: ECSA obtained for the different materials.

Material	ECSA (cm^2)
Cu Cu_2O	0.22
CU Cu_2O/RGO 2:1	0.56
CU Cu_2O/RGO 1:1	1.65
CU Cu_2O/RGO 1:2	1.66
RGO	0.90

The procedure to obtain ECSA values follow the reference [6].

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