

Supporting Information

CeO₂-promoted Cu₂O-based catalyst sprayed on gas diffusion layer for the electroreduction of carbon dioxide to ethylene

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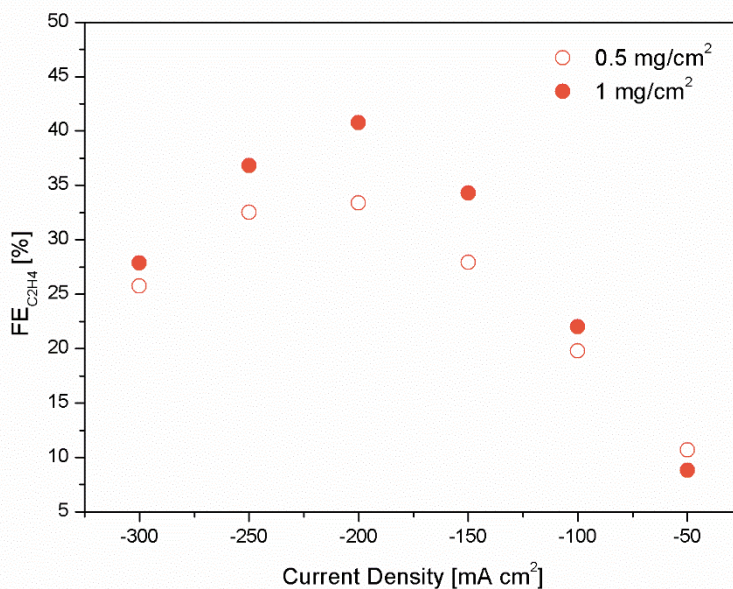


Figure S11. Control test of the catalyst loading.

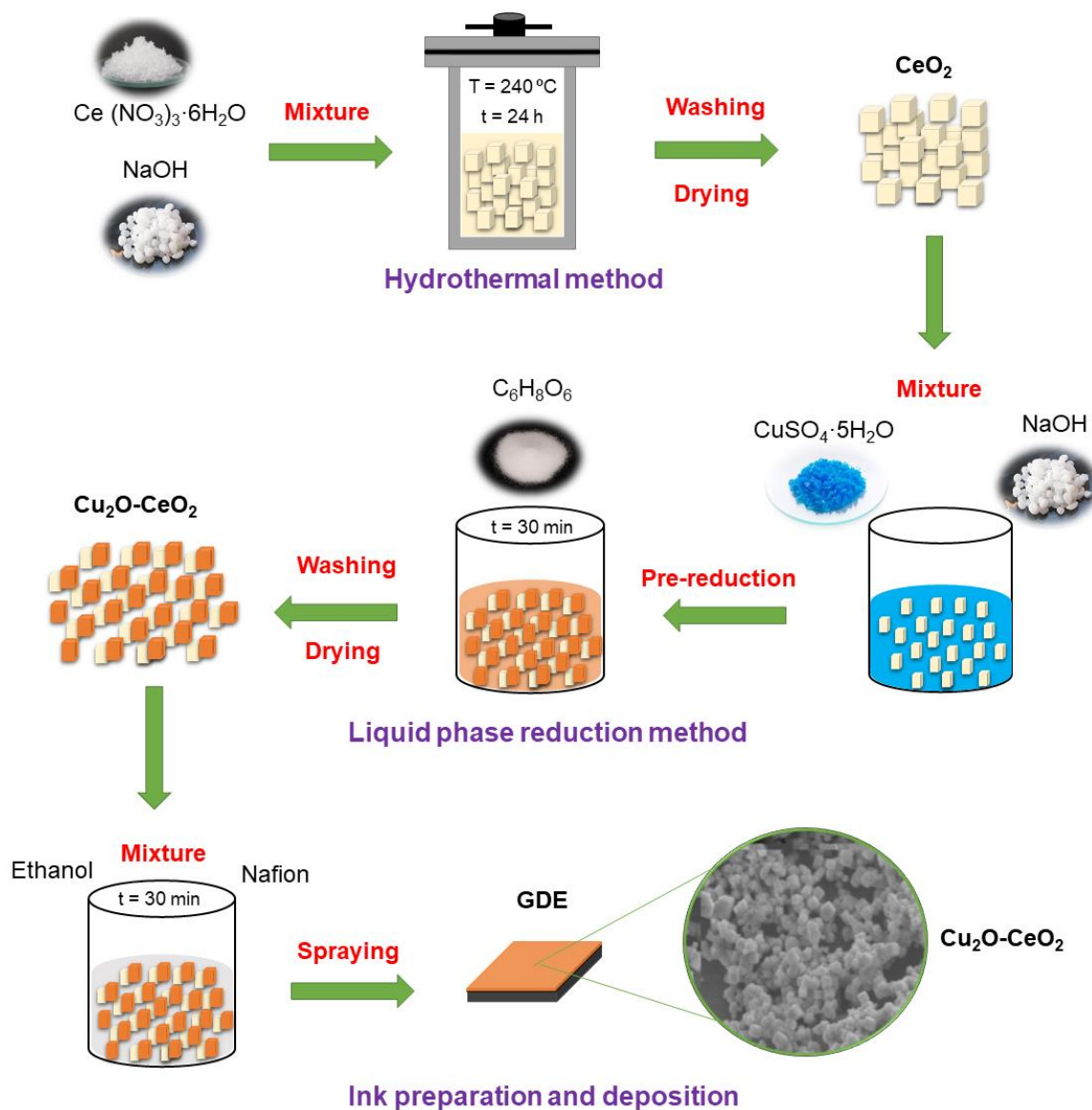


Figure S12. Schematic representation of the catalyst and GDE preparation.

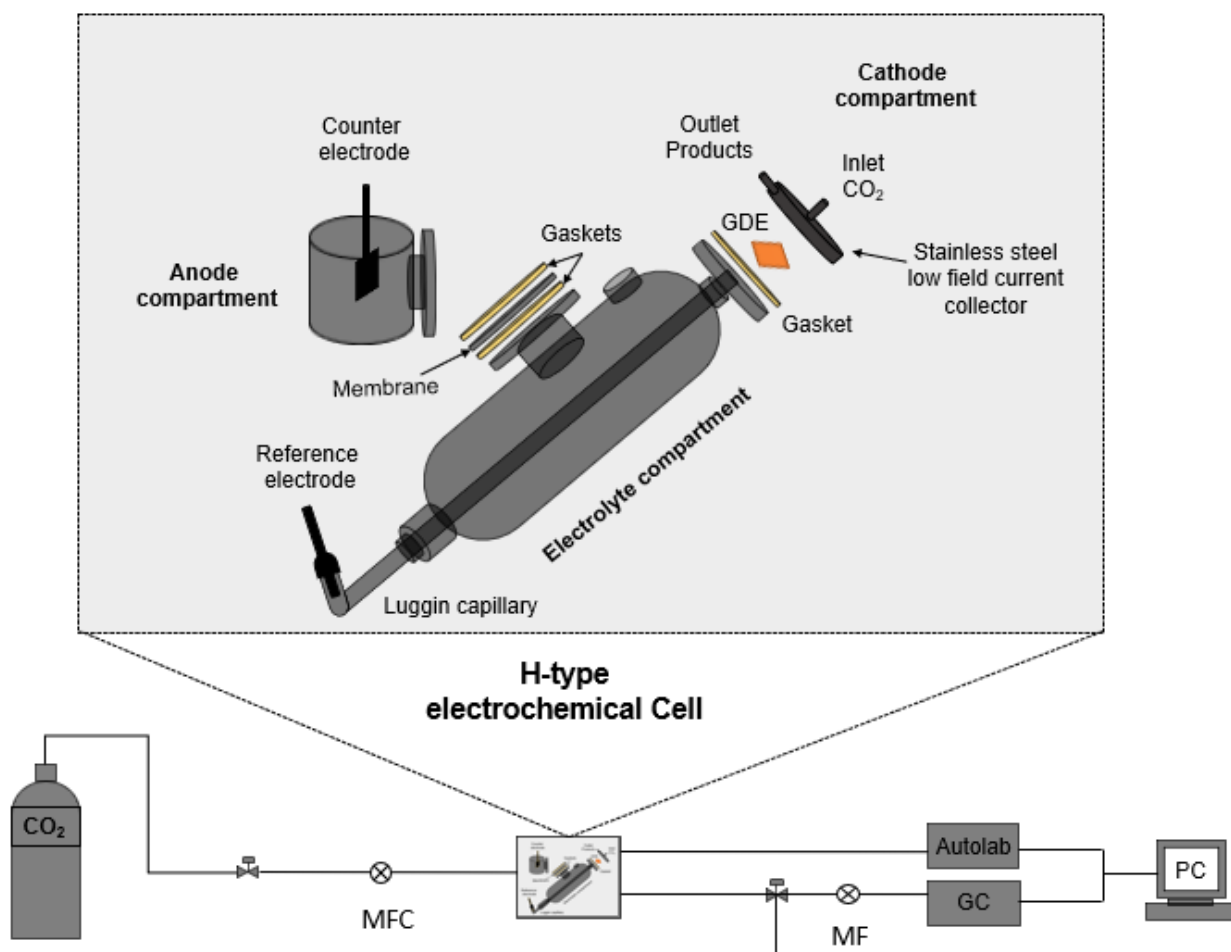


Figure S13. The CO₂RR workstation equipped with a homemade H-type cell.

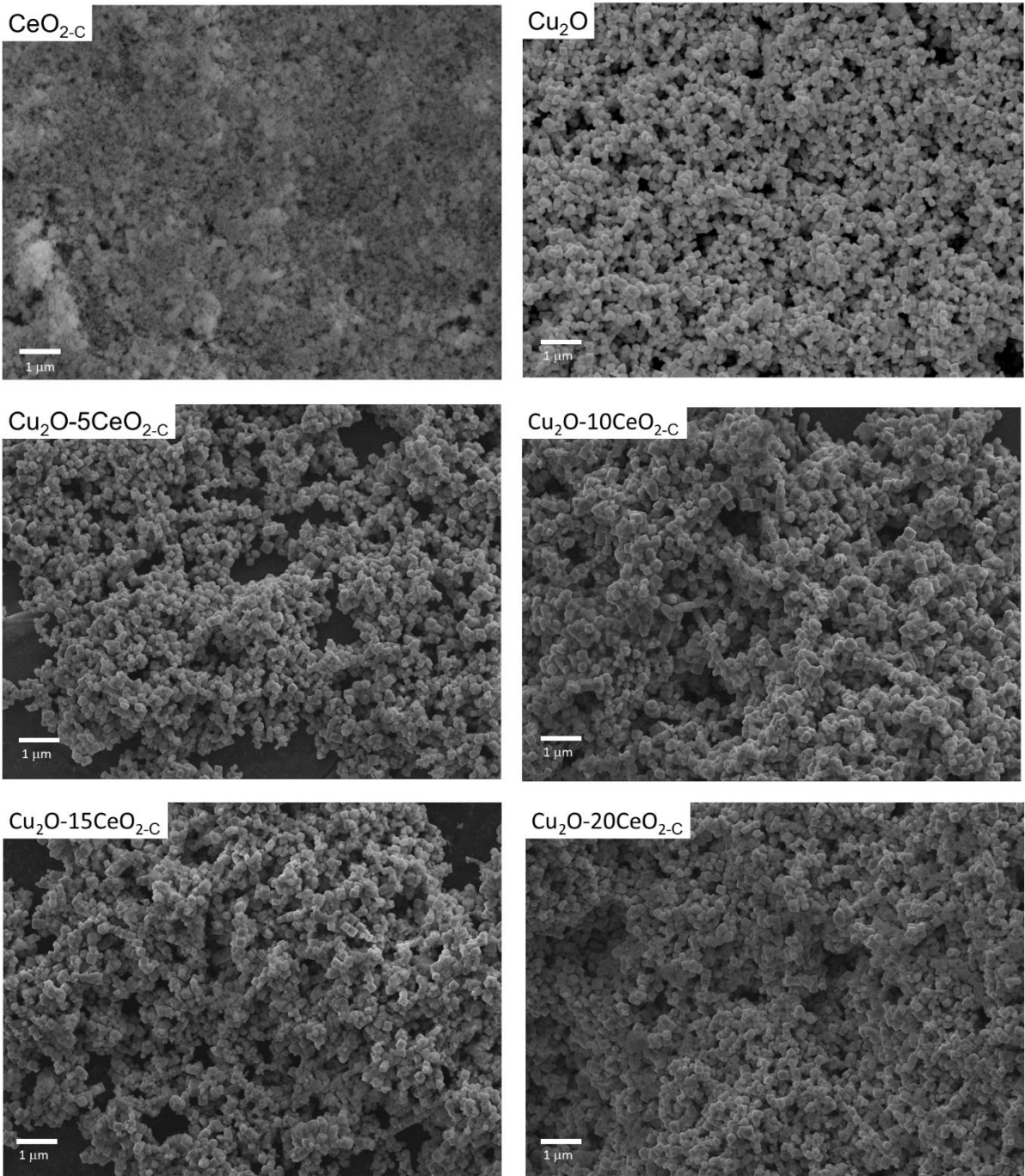


Figure SI4. SEM images of the series of CeO_{2-c} -promoted Cu_2O -based catalysts. Cubic-like CeO_{2-c} was prepared at $T = 240^\circ\text{C}$

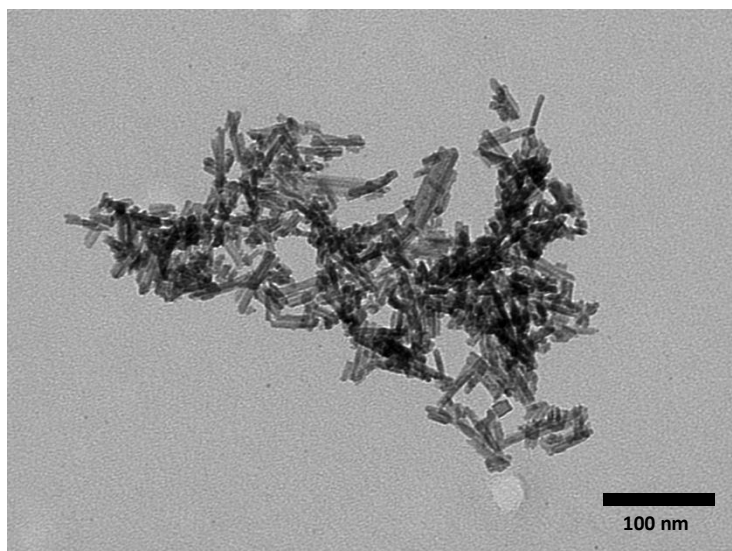


Figure S15. TEM images of the rod-like CeO_{2-R} prepared at T = 80°C

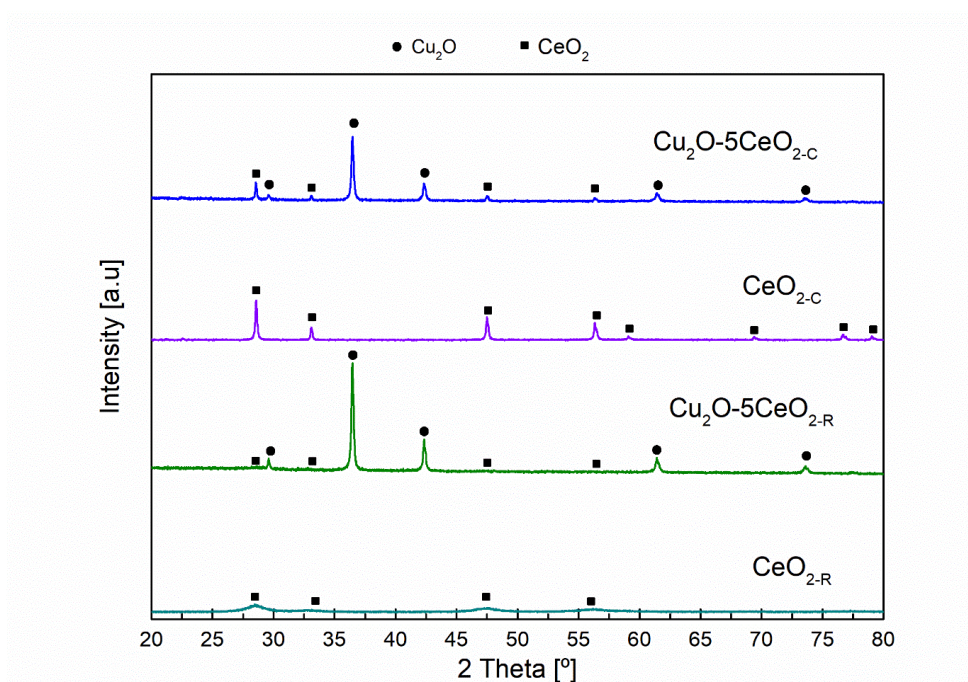


Figure S16. XRD pattern of the Cu₂O-5CeO_{2-C}, Cu₂O-5CeO_{2-R}, CeO_{2-C} and CeO_{2-R}

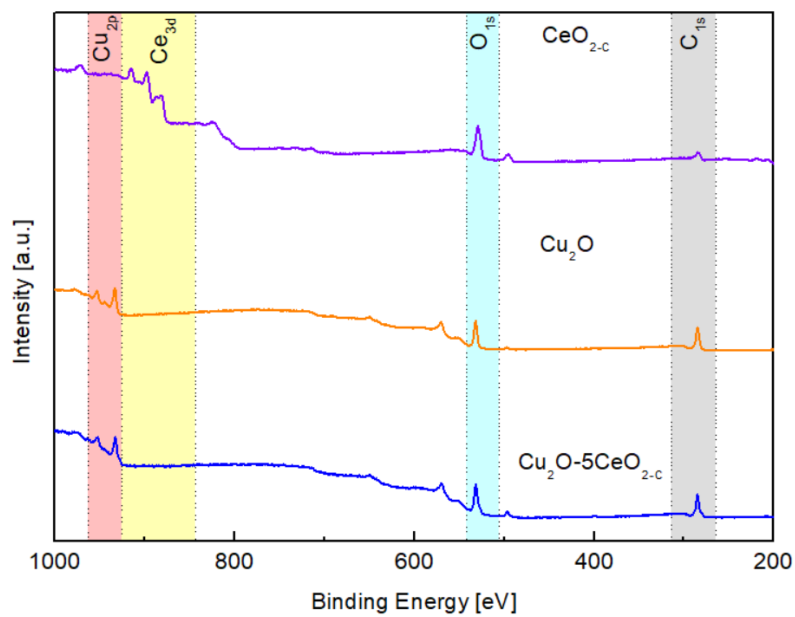


Figure S17. XPS spectra of CeO_{2-c}, Cu₂O and Cu₂O-5CeO_{2-c} catalysts.

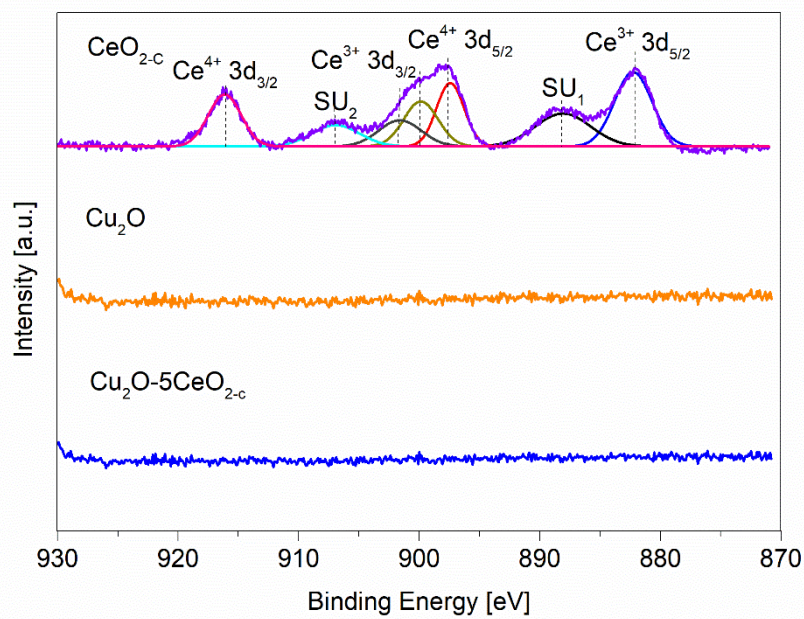


Figure S18. Ce 3d XPS spectra of CeO_{2-c}, Cu₂O and Cu₂O-5CeO_{2-c}.

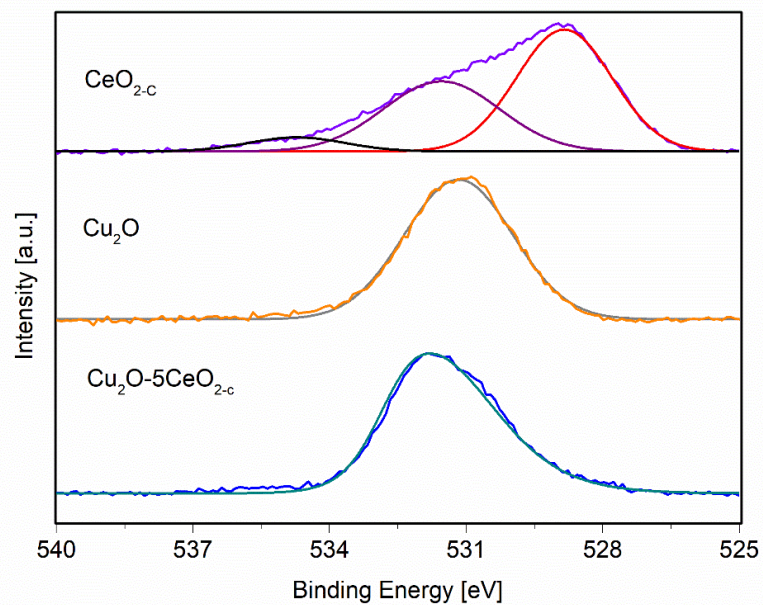


Figure S19. O 1s XPS spectra of CeO_{2-c} , Cu_2O and $\text{Cu}_2\text{O}-5\text{CeO}_{2-c}$.

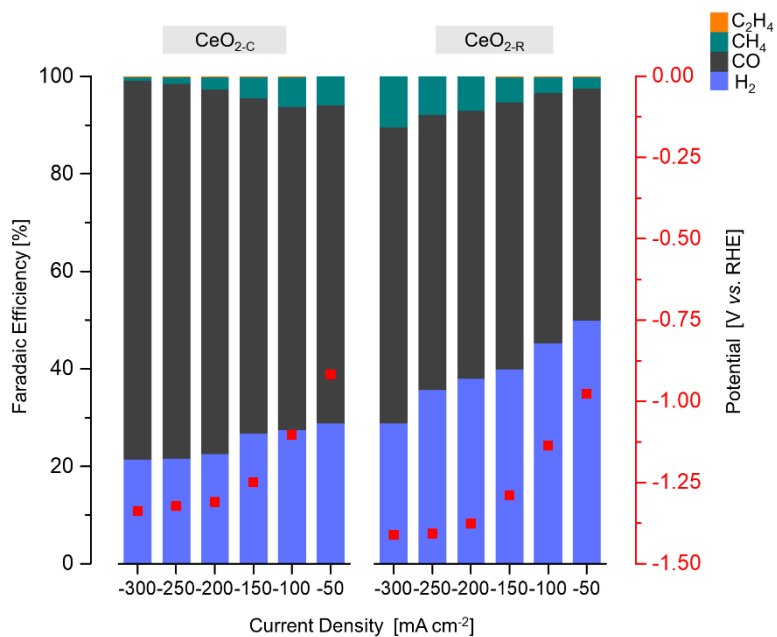


Figure S110. Performance comparison between CeO_{2-c} and CeO_{2-R} GDEs. The FE [%] and potential [V vs. RHE] as a function of the j [mA cm^{-2}].

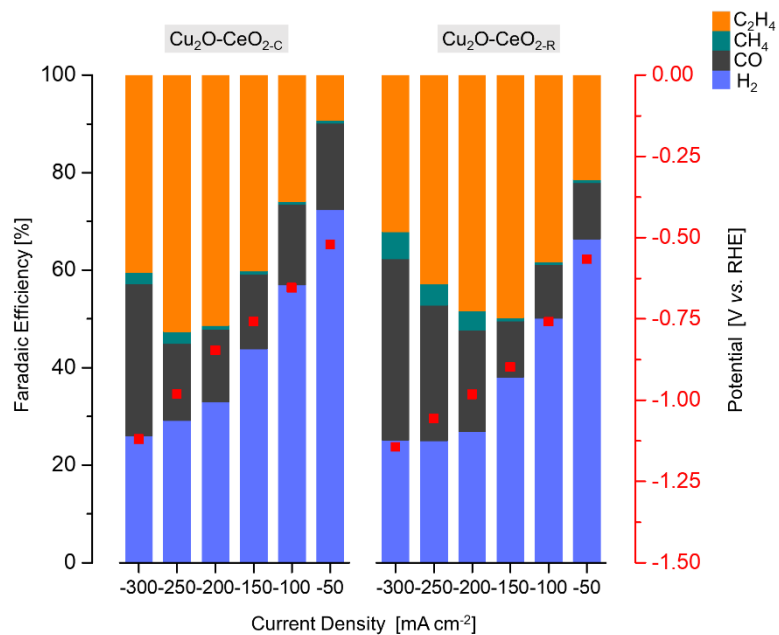


Figure SI11. Performance comparison between $\text{Cu}_2\text{O-5CeO}_{2-\text{C}}$ and $\text{Cu}_2\text{O-5CeO}_{2-\text{R}}$ GDEs. The FE [%] and potential [V vs. RHE] as a function of the j [mA cm^{-2}].

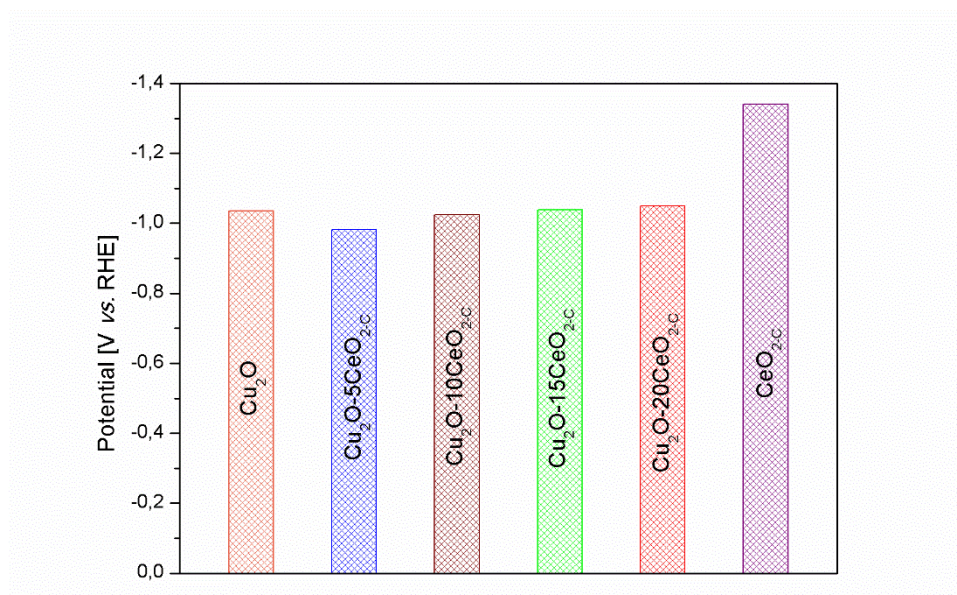


Figure SI12. Potential values of the series of GDEs at $j = 250 \text{ mA cm}^{-2}$.

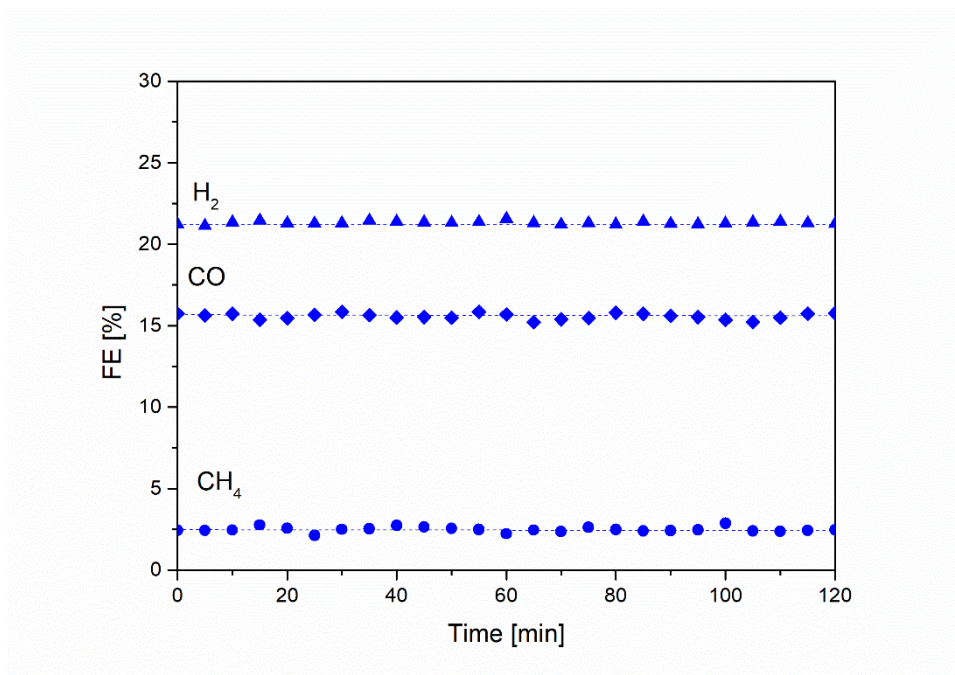


Figure SI13. FE [%] as a function of the time [h] over the Cu₂O-5CeO_{2-C} GDE. Reaction conditions: electrolyte = 1 M KOH and $j = -250\text{m Acm}^{-2}$.

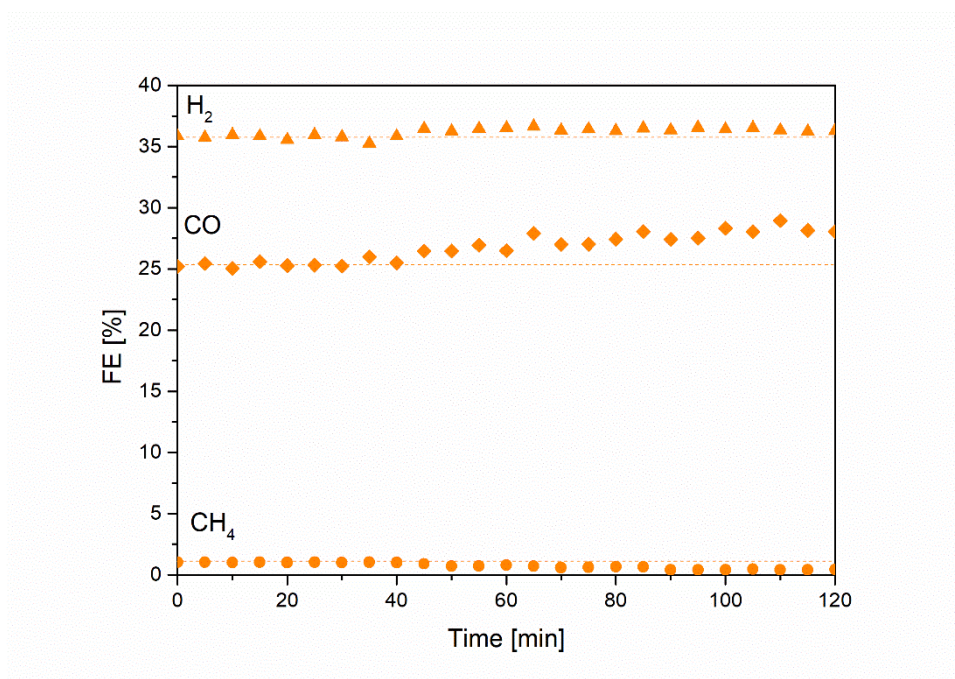


Figure SI14. FE [%] as a function of the time [h] over the Cu₂O GDE. Reaction conditions: electrolyte = 1 M KOH and $j = -250\text{m Acm}^{-2}$.

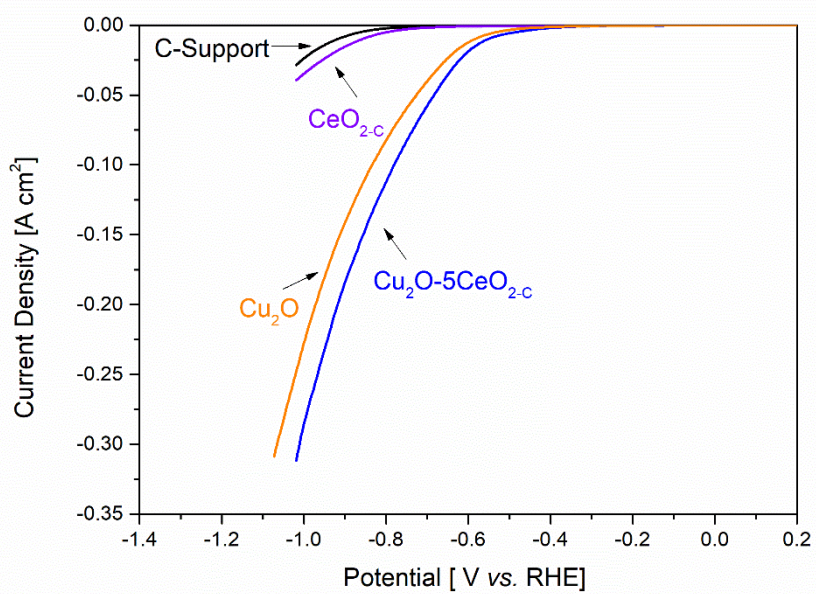


Figure S115. LSV curves on the different GDEs with a CO₂-flowed at 1 M KOH electrolyte.

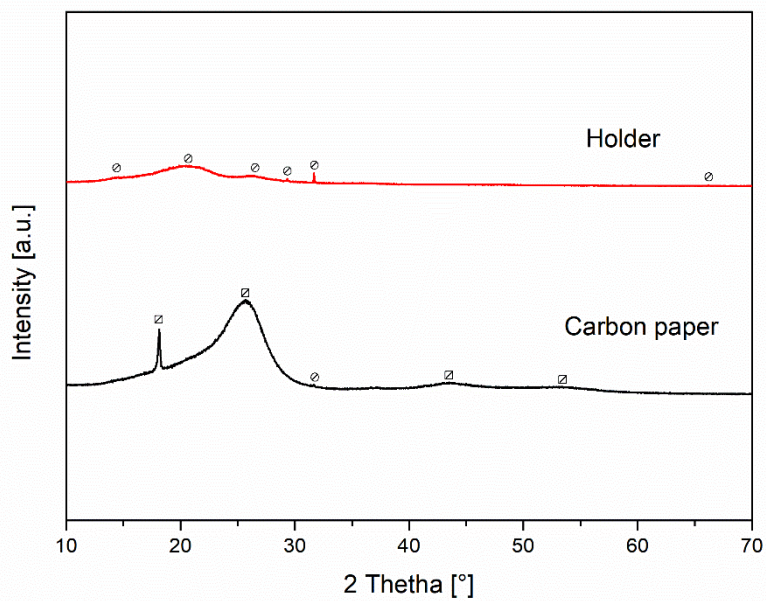


Figure S116. XRD pattern of blank (holder) and support (carbon paper)

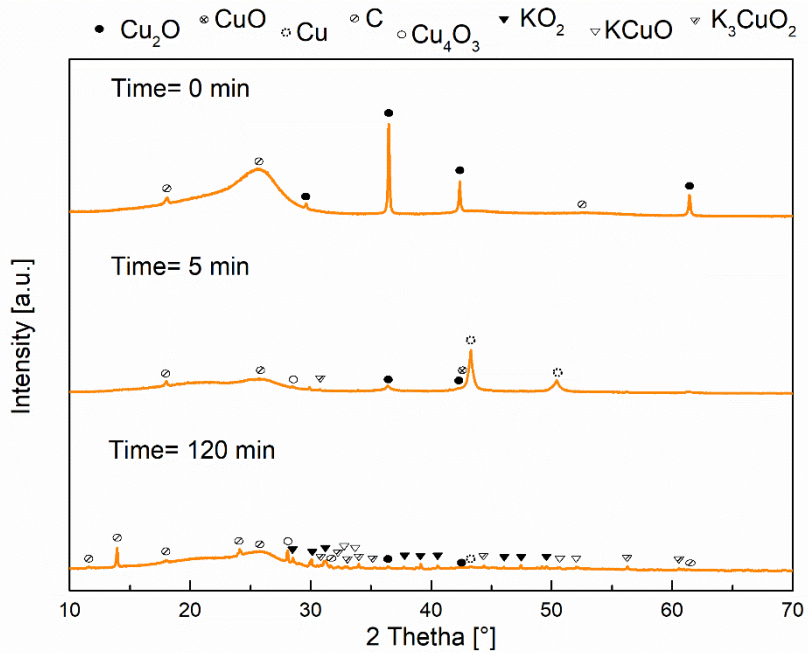


Figure S117. XRD pattern of Cu_2O GDEs at different reaction times.

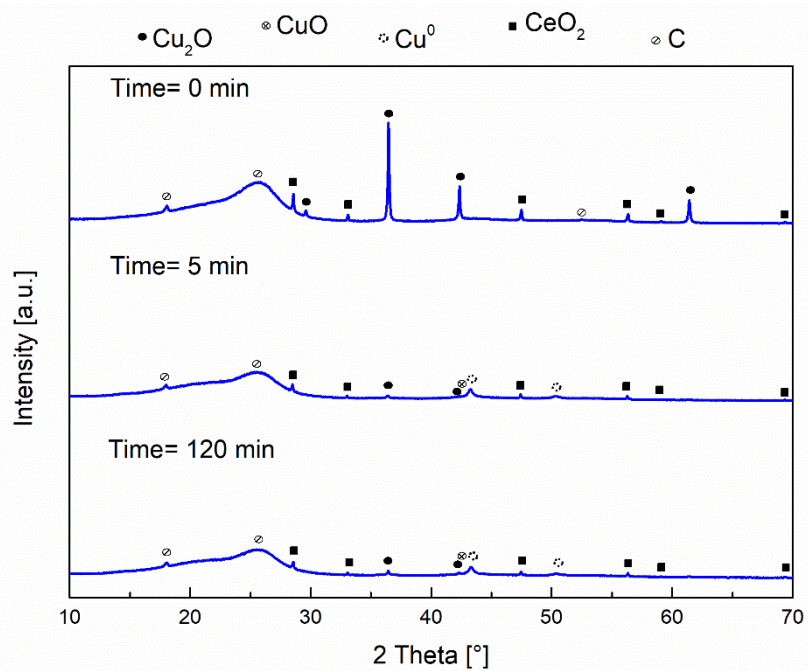


Figure S118. XRD pattern of Cu_2O - 5CeO_2 GDEs at different reaction times.

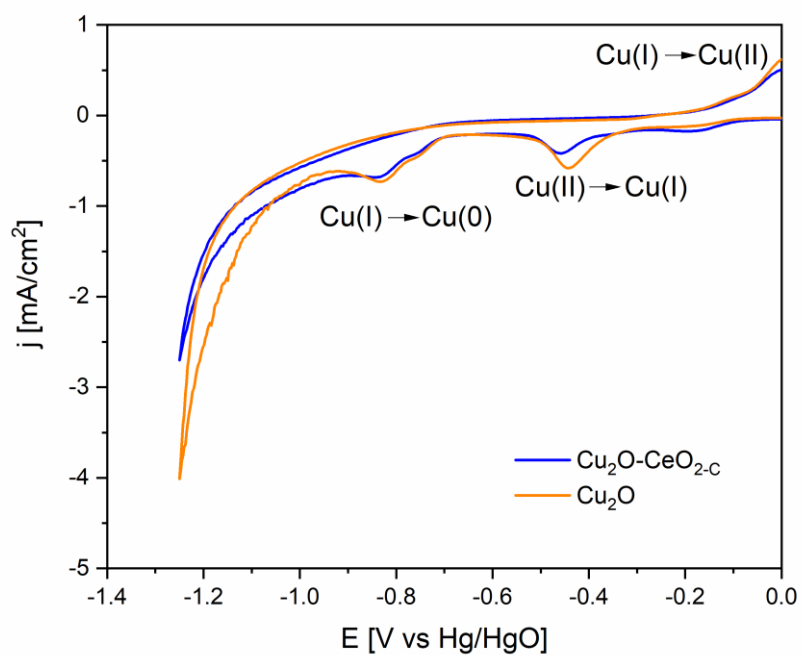


Figure S119. CV curves on the Cu_2O and $\text{Cu}_2\text{O-CeO}_2\text{-C}$ GDEs with a CO_2 -flowed at 1 M KOH electrolyte.

Table S11. Crystallite sizes of the main Cu^x species of the fresh and used GDEs.

Sample		$dp_{\text{Cu}_2\text{O}}$ [nm]	dp_{CuO} [nm]	dp_{Cu} [nm]	dp_{CeO_2} [nm]
Cu_2O	Fresh	167	-	-	-
	Used	196	87	20	-
$\text{Cu}_2\text{O-5CeO}_2$	Fresh	162	-	-	45
	Used	164	25	13	49

Table S12. Elemental composition of the fresh and used GDEs.

Sample		O [wt.%]	Cu [wt.%]	Ce [wt.%]	K [wt.%]
Cu_2O	Fresh	11	89	.	-
	Used	18	40	-	42
$\text{Cu}_2\text{O-5CeO}_2$	Fresh	13	82	5	-
	Used	9	79	6	6

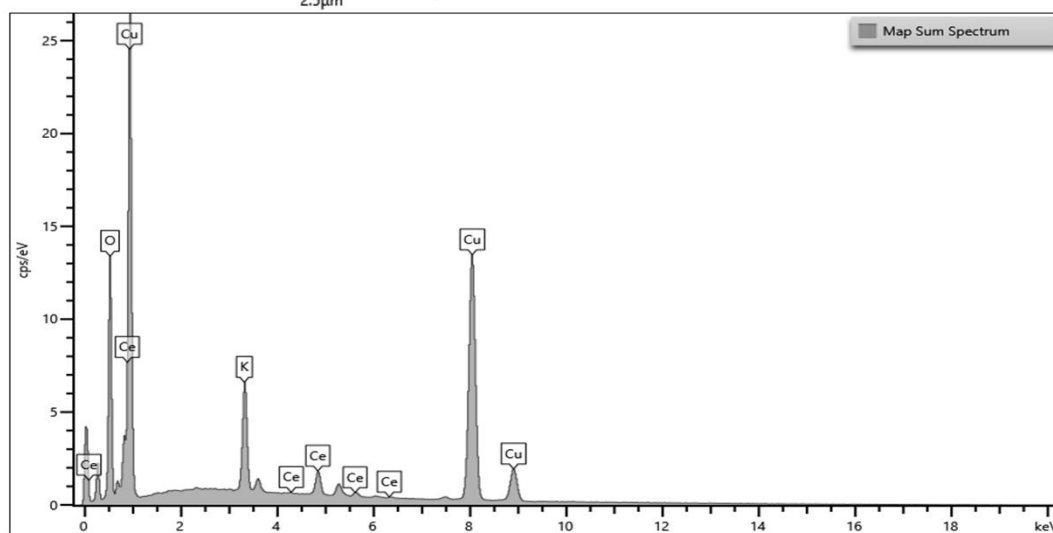
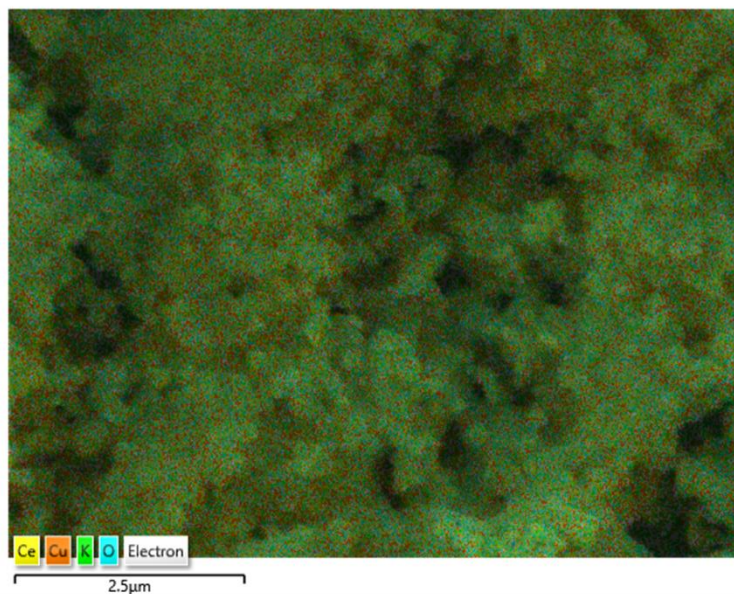


Figure S120. Post-catalysis SEM-EDS for $\text{Cu}_2\text{O}-5\text{CeO}_2$ GDE.

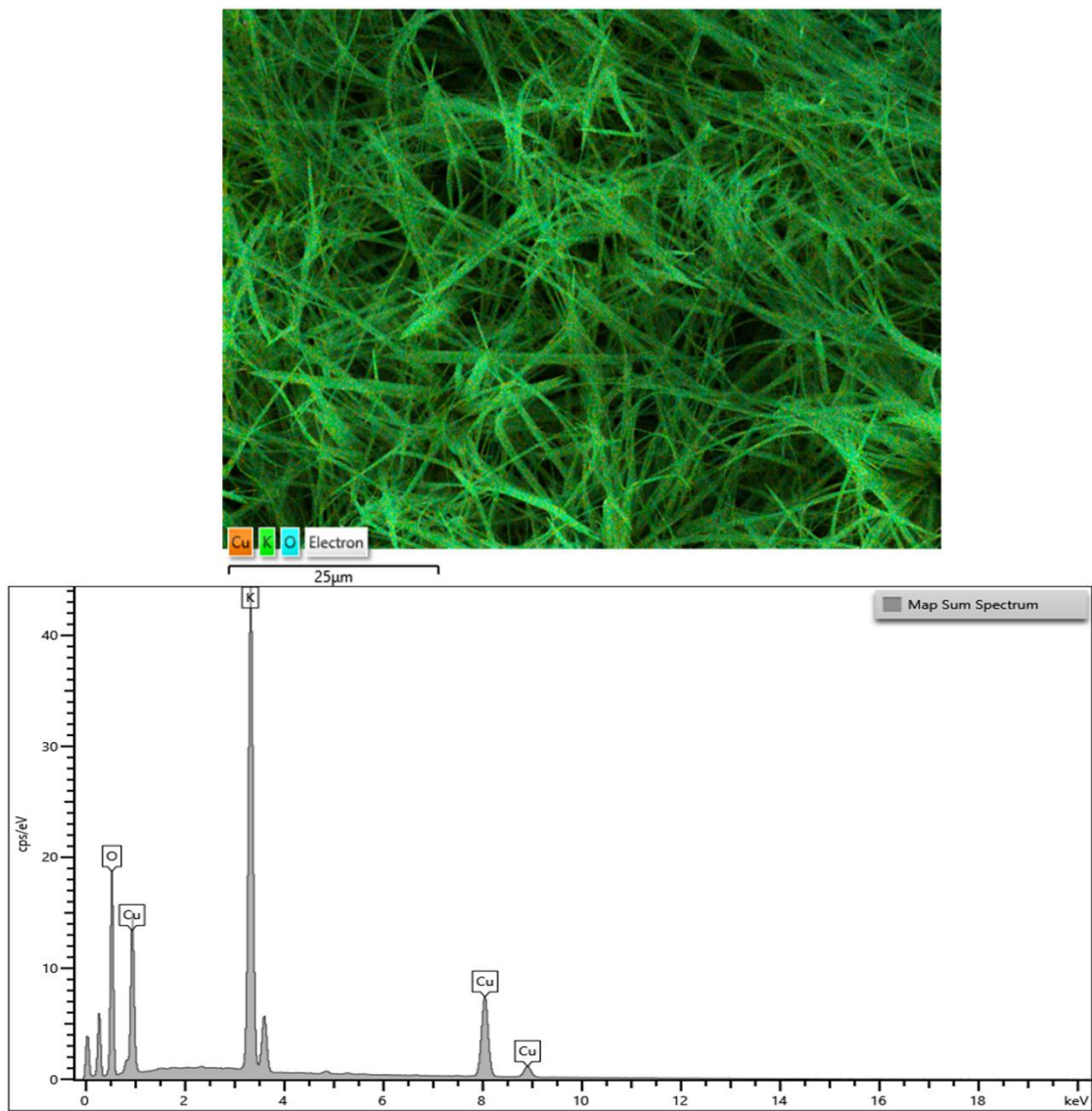


Figure S121. Post-catalysis SEM-EDS for Cu₂O GDE.