Supporting Information

A Strong Magnetic Field Alters the Activity and Selectivity of the CO_2RR by Restraining C–C Coupling

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Supplementary Figures and Tables

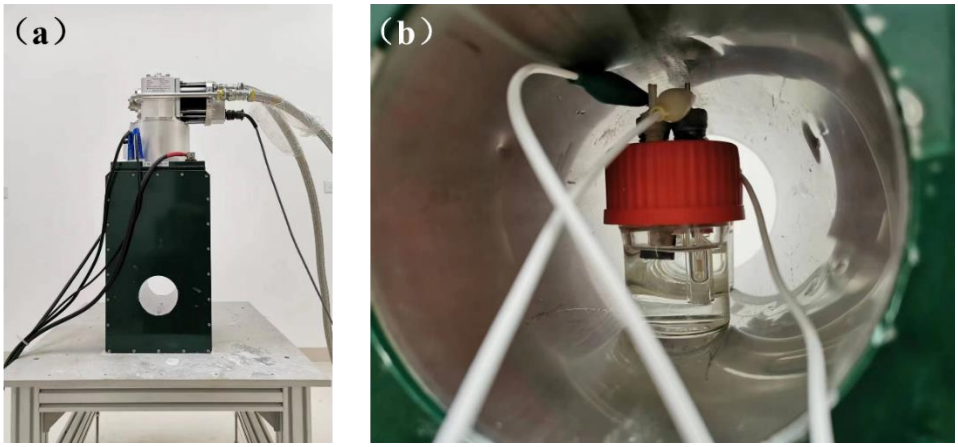

Figure S1. (a) The Installation photograph of mini cryogen free magnetic system. (b) the cavity and H-cell in the magnetic system.

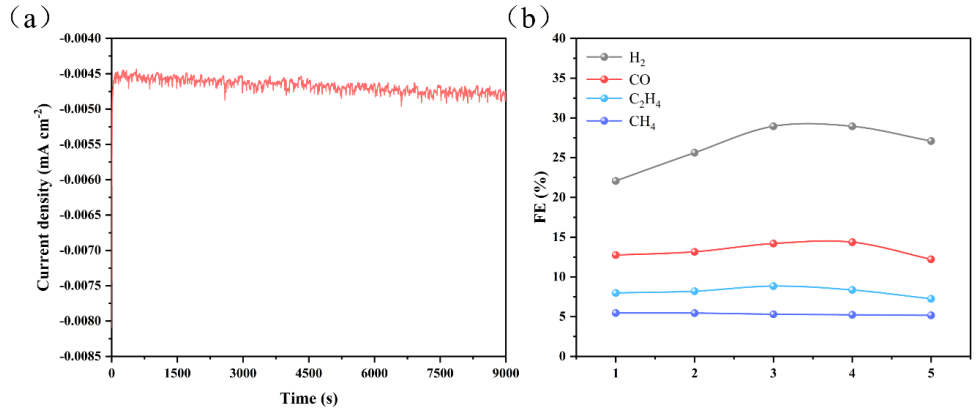

Figure S2. (a) 2.5-h plot of current density vs time at 1.0 V_{RHE}. The gas phase products were collected every half hour, (b)the Faraday efficiency of H_2, CO, C_2H_4 and CH_4. the test was performed in 0.1 M $KHCO_3$ solution.

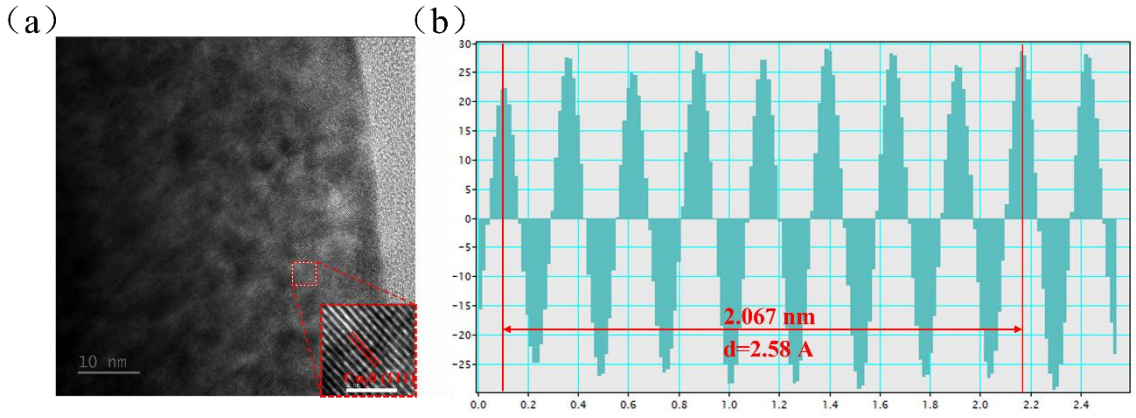

Figure S3. (a) HRTEM images of pretreated Cu_2O nanocubes. (b) the corresponding intensity profile for the line scan across the lattice fringes of Cu_2O.

Table S1. The Atomic Fraction of Cu, O and their atomic Error of as-prepared, pretreated and after-test Cu_2O catalyst.

	Atomic Fraction of Cu (%)	Atomic Fraction of O (%)	Atomic Error of Cu (%)	Atomic Error of O (%)
As-prepared	68.77	31.23	16.09	6.01
Pretreated	68.82	31.18	16.10	6.00
After test	71.02	28.98	16.80	5.68

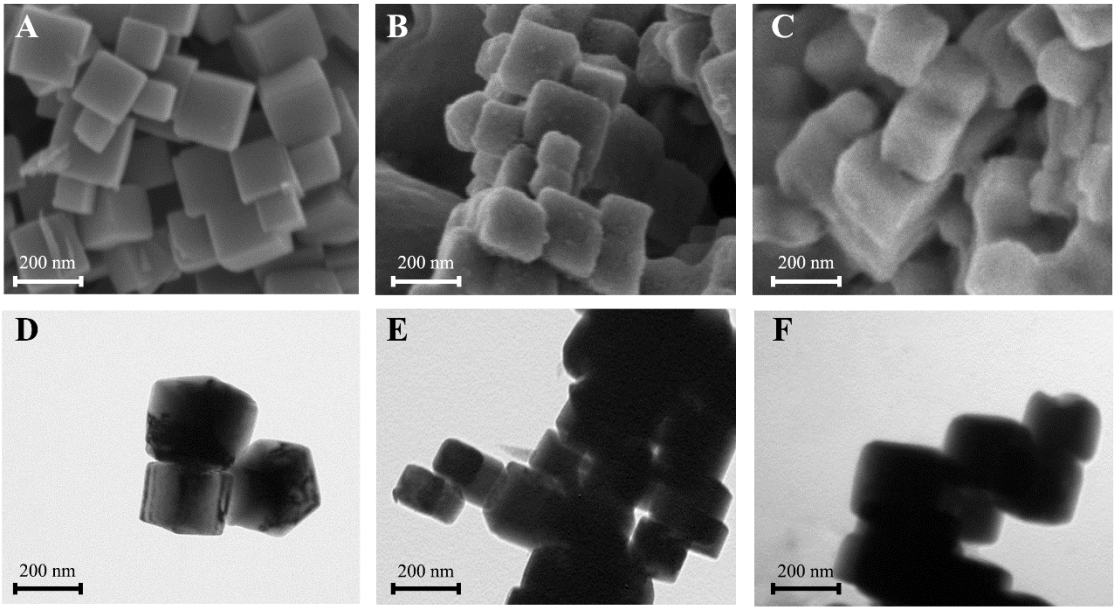

Figure S4. SEM images of (a) as-prepared Cu_2O, (b) pretreated Cu_2O and (c) Cu_2O after test. TEM images of (d) as-prepared Cu_2O, (e) pretreated Cu_2O and (f) Cu_2O after test.

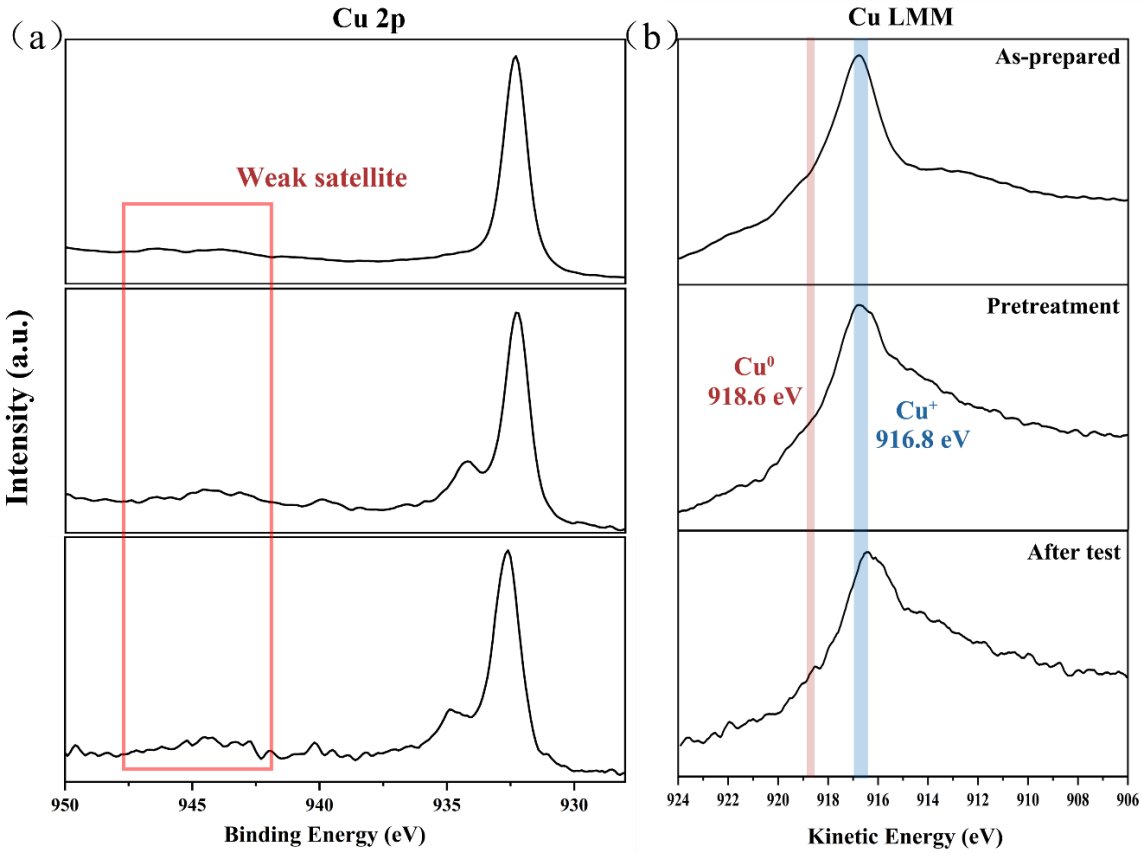

Figure S5. (a) XPS spectra of Cu 2p of the as-prepared, pretreated and after-test catalyst. The red frame shows the weak satellite peaks belonging to Cu_2O. And the satellite peak increases gradually, indicating the formation of CuO. (b) XPS spectra of Cu LMM of the as-prepared, pretreated and after-test catalyst. The peak at 918.6 eV increases gradually, indicating that Cu_2O is partially reduced to metallic Cu

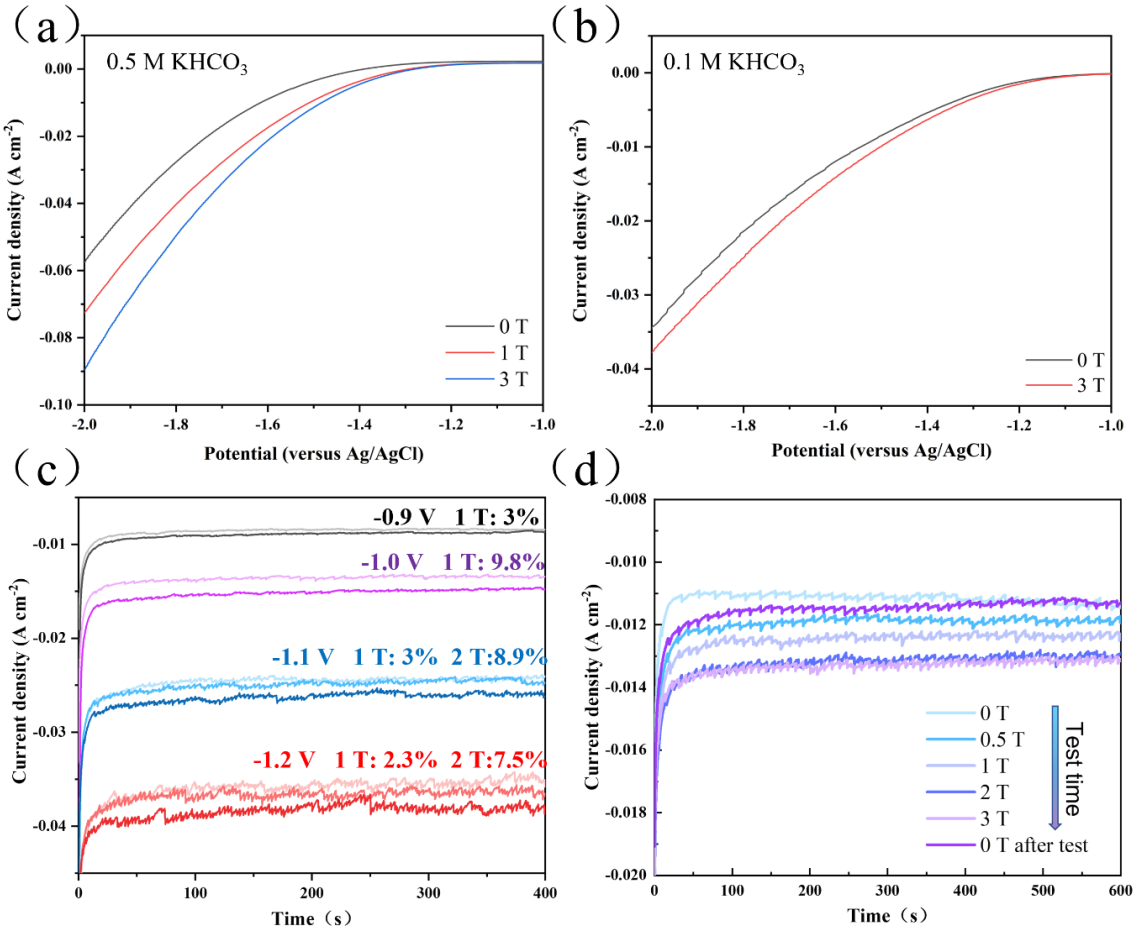

Figure S6. The LSV curves of Cu_2O under different magnetic fields in (a) 0.5 M $KHCO_3$ and (b) 0.1 M $KHCO_3$. (c) Plot of current density vs time of Cu_2O under different magnetic fields at -0.9, -1.0, -1.1, -1.2 V_{RHE}. The test was performed in 0.1 M $KHCO_3$. (d) Plot of current density vs time at 1.0 V_{RHE} under different magnetic fields. The test sequence is 0T-0.5T-1T-2T-3T-0T. And the test was performed in 0.1 M $KHCO_3$.

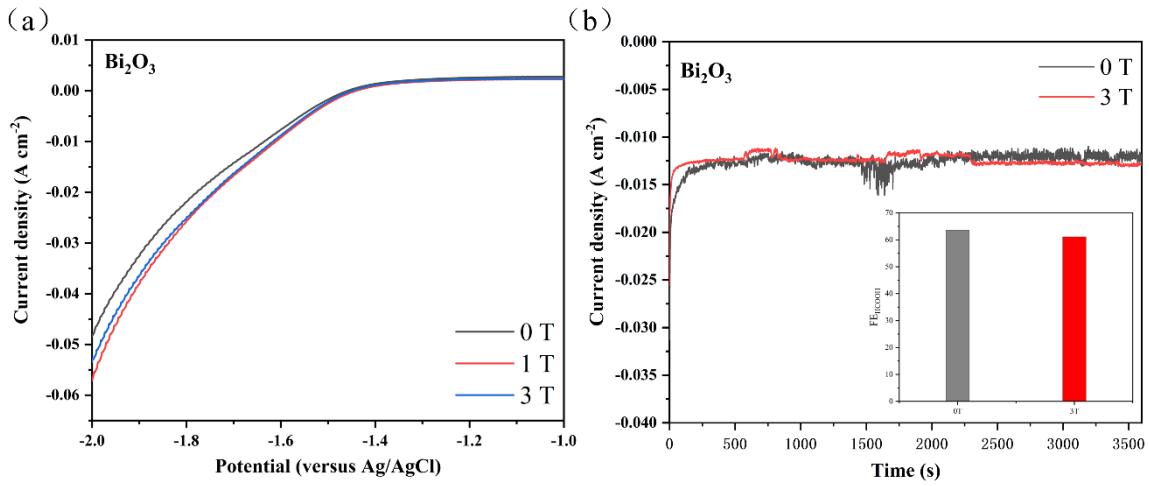

Figure S7. (a) LSV curves of Bi_2O_3 in 0T, 1T, 3T magnetic field. (b) Plot of current density vs time at -1.0V_{RHE} and the FE of HCOOH in a 0 T/3 T magnetic field. All the tests were performed in 0.5M $KHCO_3$ solution.

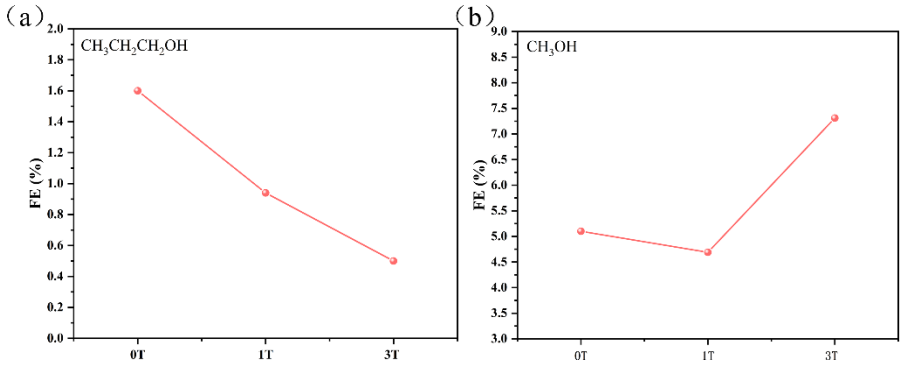

Figure S8. The FE of $CH_3CH_2CH_2OH$ and CH_3OH at -1.0 V_{RHE} under 0 T/1T/3T.

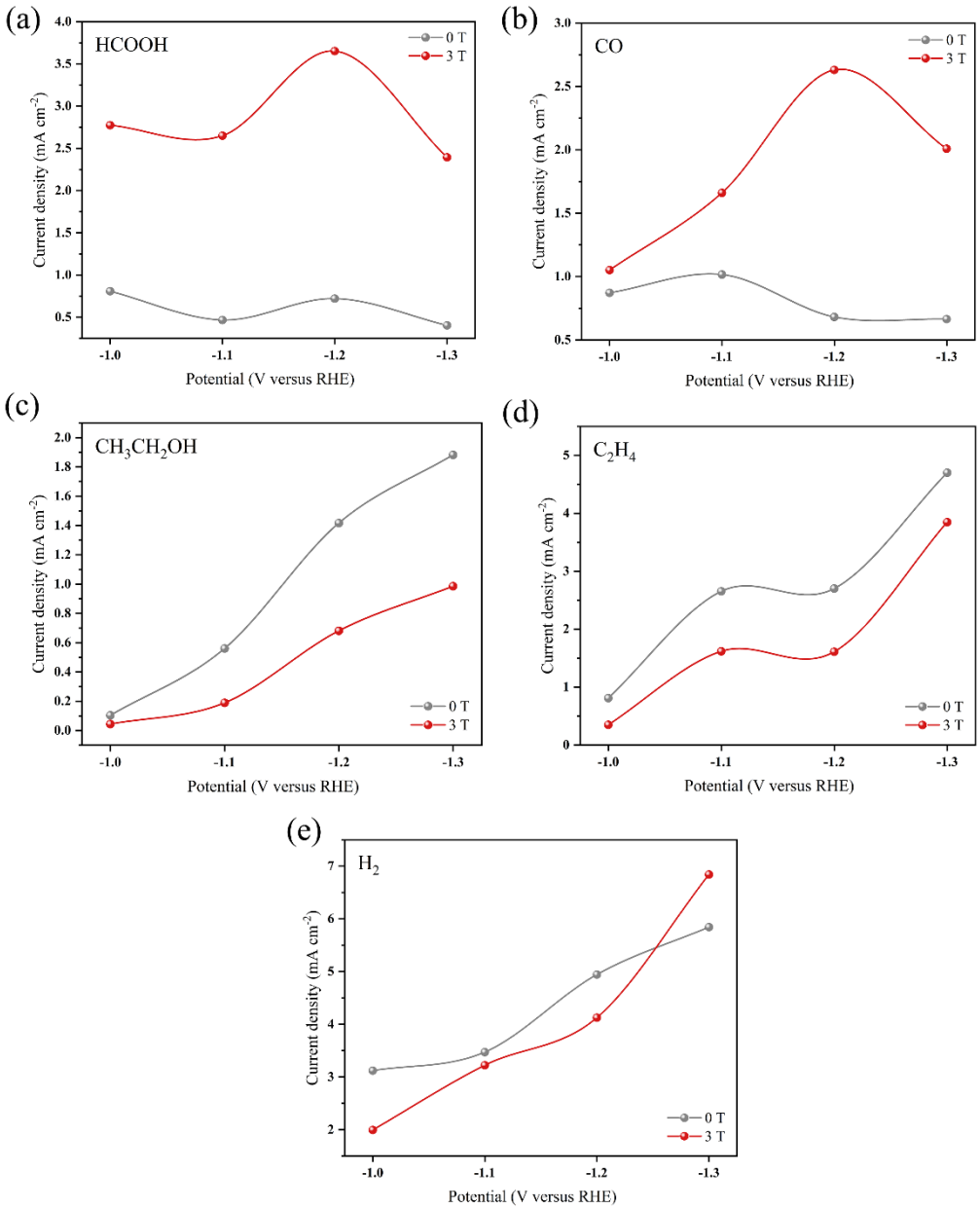

Figure S9. Partial current density of different products of Cu_2O in 0T/3T magnetic fields: (a) HCOOH, (b)CO, (c)CH_3CH_2OH, (d)C_2H_4, (e)H_2. All the tests were performed in 0.1 M $KHCO_3$ solution.

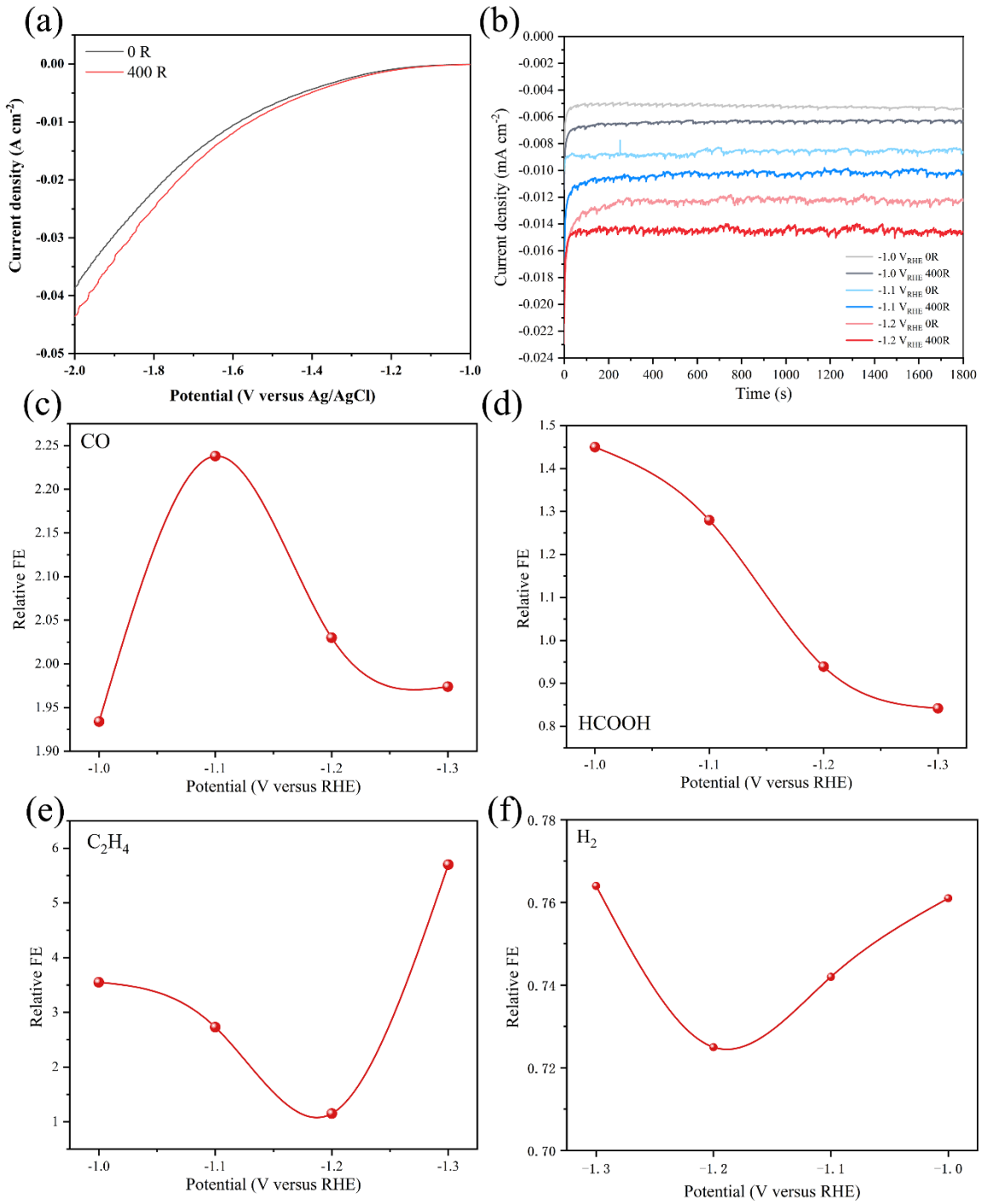

Figure S10. (a) The LSV curves of Cu_2O under different rotational speed, 0 R and 400 R represent the speed of the magnetic agitator is 0 RPM and 400 RPM, respectively. (b) The plot of current density vs time under 0 RPM and 400 RPM. The relative Faraday efficiency of the products between 0 RPM and 400 RPM. All the tests were performed in 0.1 M $KHCO_3$ solution.

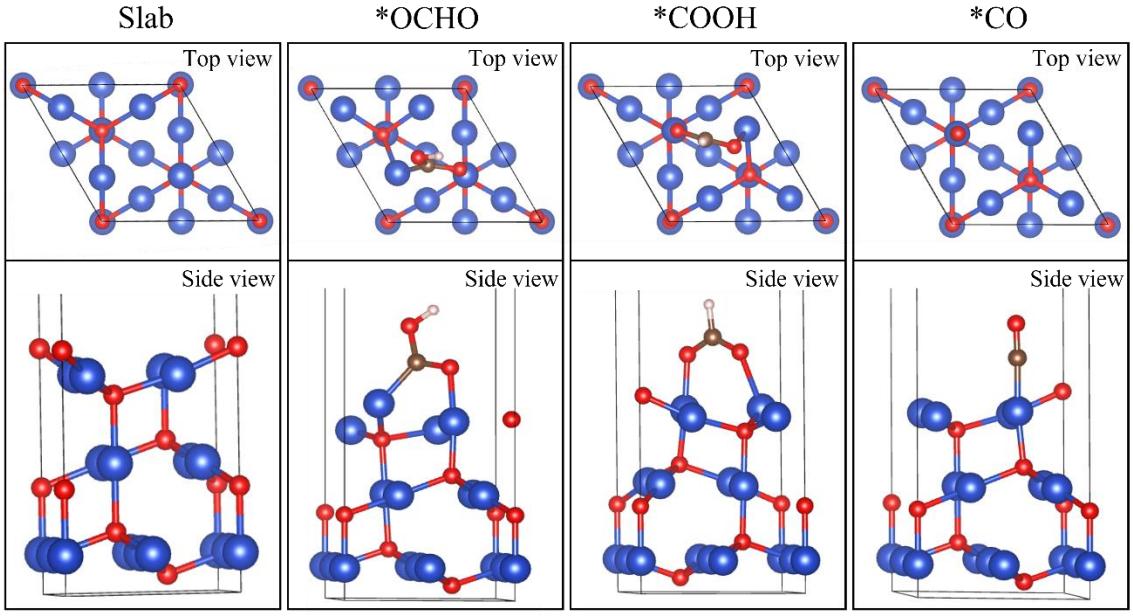

Figure S11. The optimized DFT models of Cu_2O (111) surfaces with different intermediates.

Table S2. The DFT energy, correction of zero point energy and entropy of the adsorbed and gaseous species. Here, "no mag" and "mag" represent the off and on of "LSORBIT" and "SAXIS" keywords, respectively.

		E (eV)	ZPE (eV)	TS (eV)
slab	no mag	-78.6344	\	\
	mag	-78.8676		
*OCHO	no mag	-105.684	0.624	0.198
	mag	-105.918		
*COOH	no mag	-105.133	0.604	0.254
	mag	-105.367		
*CO	no mag	-95.0475	0.199	0.169
	mag	-95.2719		
CO_2	no mag	-22.7714	0.306	0.662
	mag	-23.0207		
HCOOH	no mag	-29.8894	0.887	0.726
	mag	-29.8896		
CO	no mag	-15.33	0.131	0.611
	mag	-15.43		
H_2O	no mag	-14.1378	0.564	0.584
	mag	-14.2747		
H_2	no mag	-6.7572	0.276	0.402