

Supporting Information

On the Role of Bi and CeO₂ for the Selective Electrochemical Reduction of CO₂ to Formate on CuS Catalysts

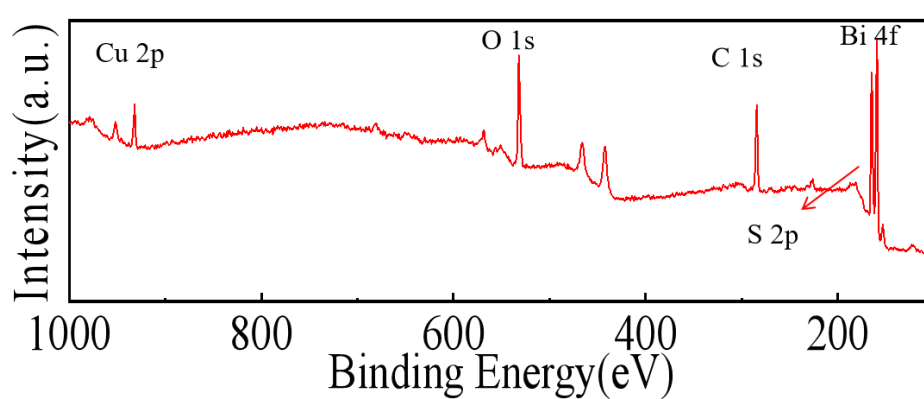


Figure S1. Survey of Bi/CeO₂/CuS

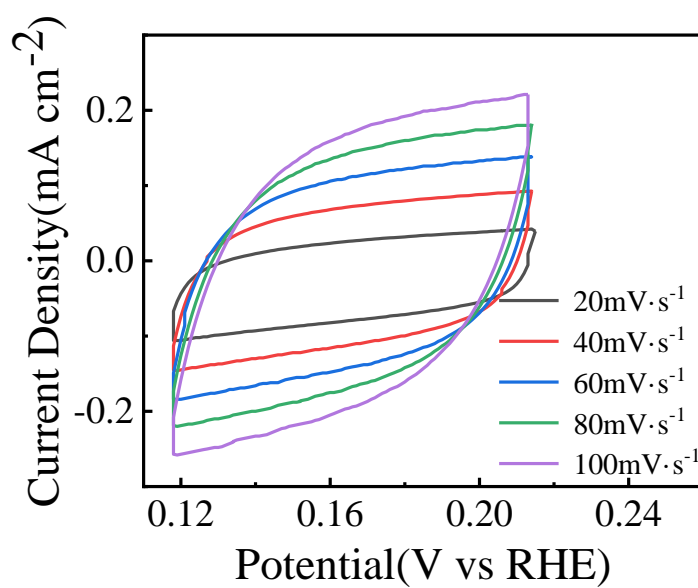


Figure S2. CV curve of CuS

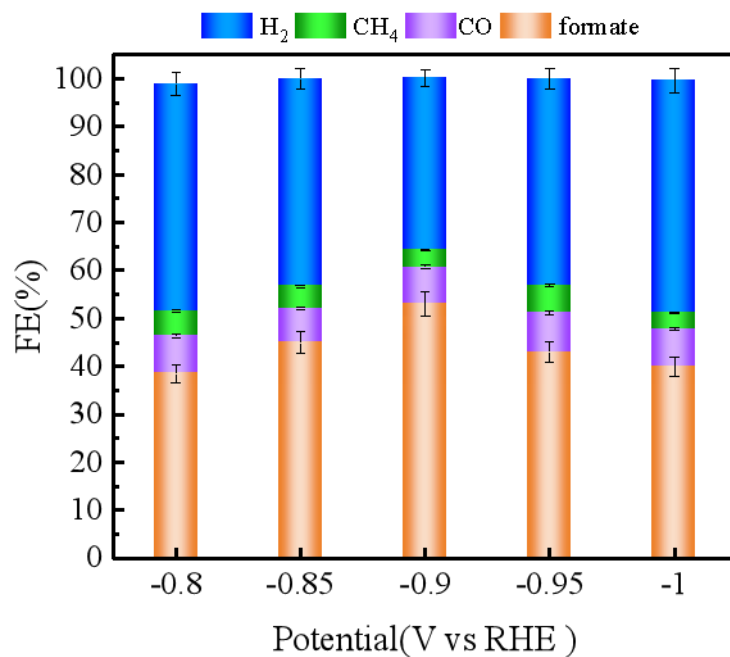


Figure S3. The FE for all products of CuS catalyst

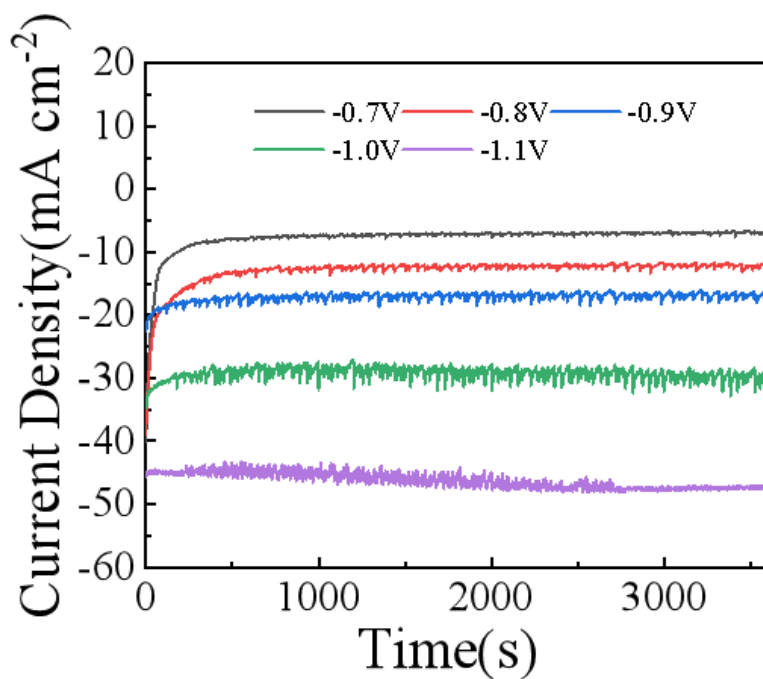


Figure S4. The current density of Bi/CeO₂/CuS at different potential

The chronoamperometry (CA) curves at various applied potentials for 1 h are shown in Figure S4, the negligible decay of current density at -1.0 V and

above indicates a stable electrocatalytic proces.

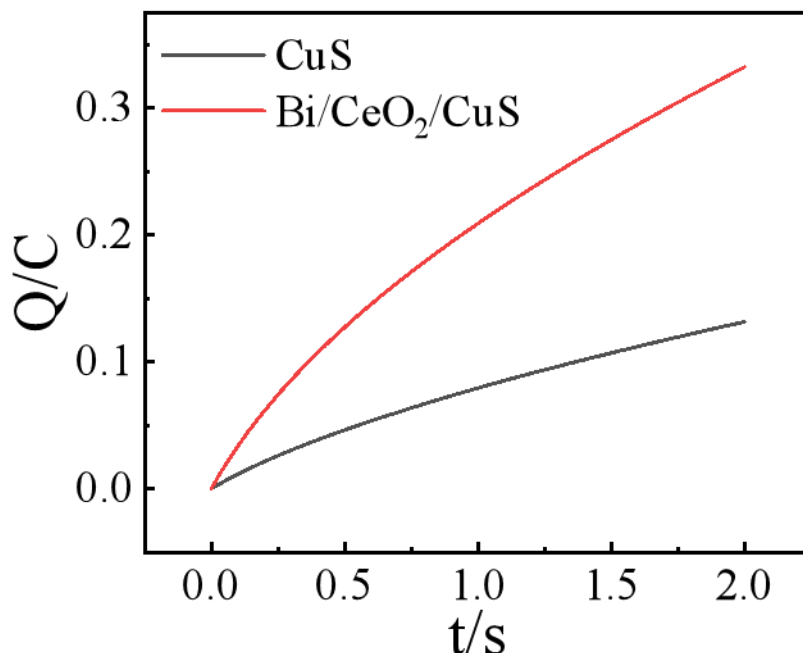


Figure S5. The effective surface area curves of different samples

Figure S6 shows the chronocoulometric curve of the CuS and Bi/CeO₂/CuS in 1mmol L⁻¹ K₃[Fe(CN)₆] containing 0.1 mol L⁻¹ KCl. According to the formula given by Anson[1].

$$Q = 2nFAcD^{1/2} t^{1/2}/(\pi^{1/2})$$

where A (cm²) is the area of the electrode, F is the Faraday constant, D (cm² s⁻¹) is the diffusion coefficient of the oxidized form, hexacyanoferrate(III), c (mol cm⁻³) is the bulk concentration of the oxidized form, t (s) is the time. For 1 mM K₃[Fe(CN)₆], n=1, D=7.6×10⁻⁶ cm² s⁻¹. The electroactive surface areas of the CuS and Bi/CeO₂/CuS were calculated to be 0.0132 cm² and 0.032 cm², respectively. It indicates that the Bi/CeO₂/CuS possess the highest electroactive surface area, enhancing the electrochemical response.

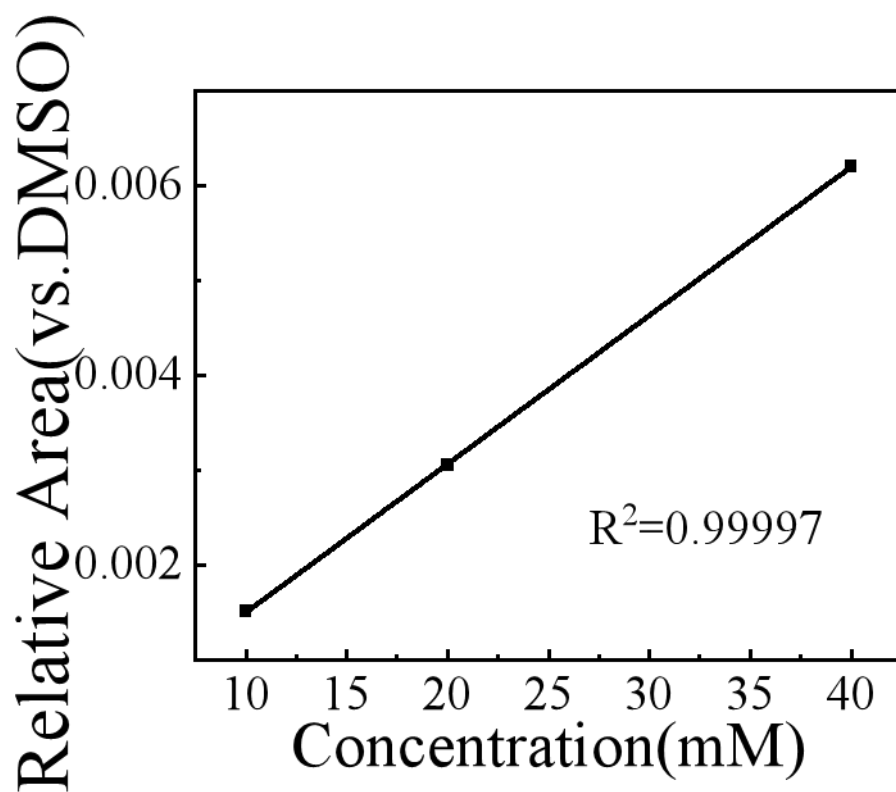


Figure S6. Standard curve of formate

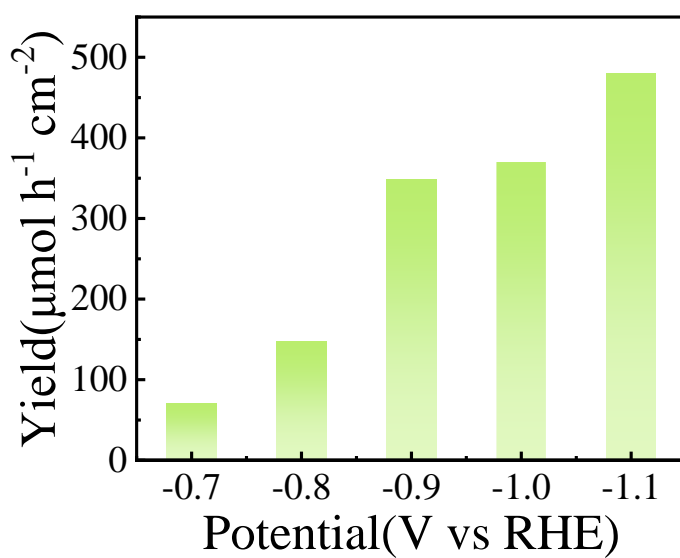


Figure S7. Formate yield of Bi/CeO₂/CuS

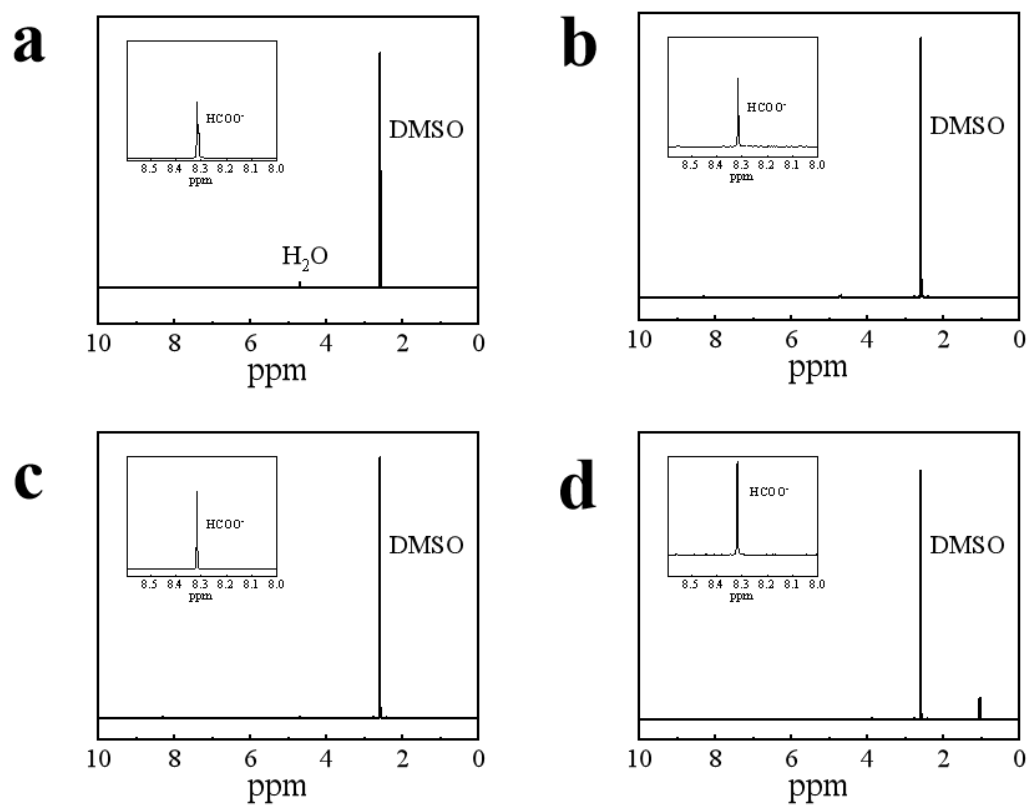


Figure S8. (a-c) The NMR of different concentration standard, (d) The NMR of Bi/CeO₂/CuS at -0.9 V vs. RHE

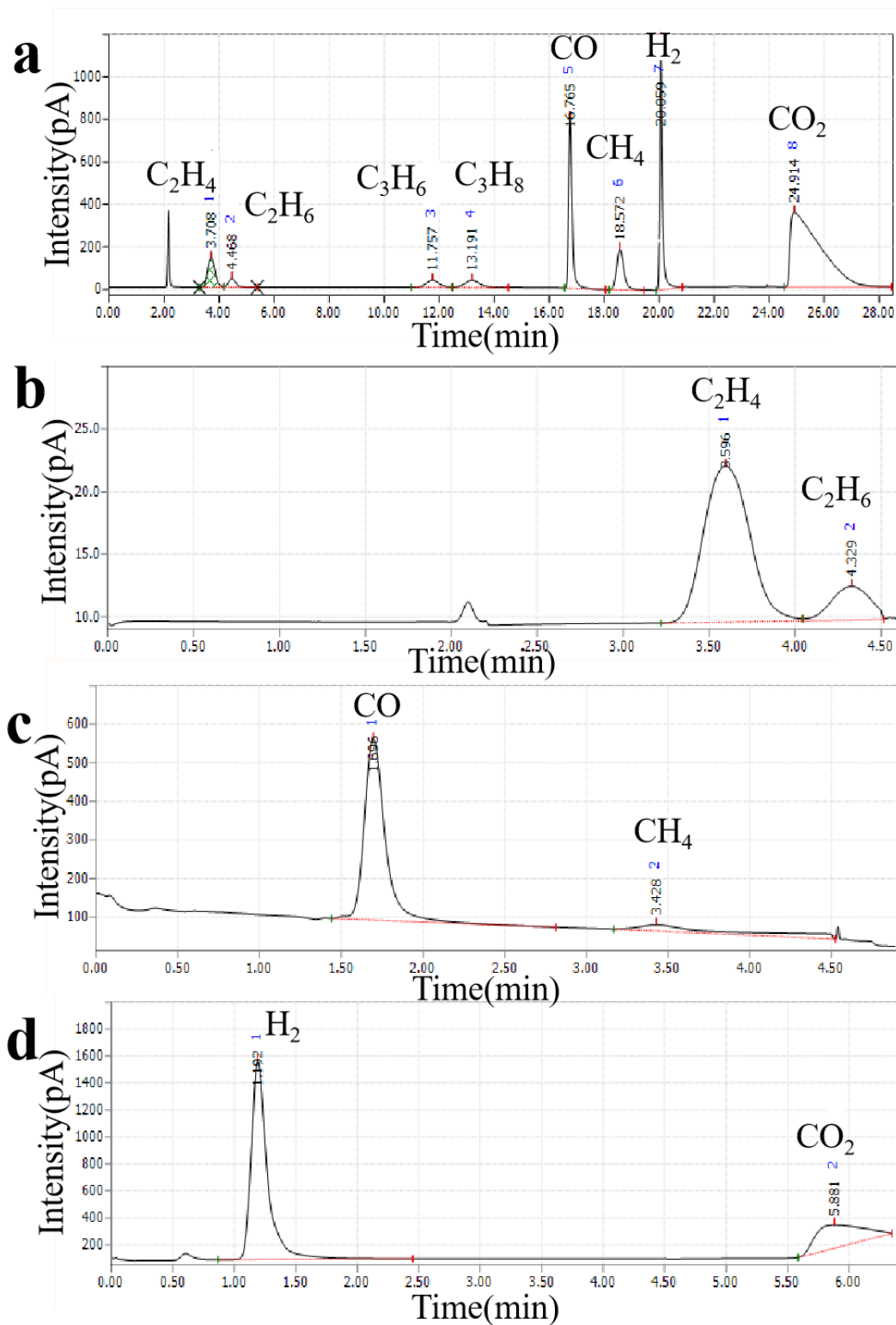


Figure S9. (a) The GC of standard, (b) The GC FID 1 image of simple, (c) The GC FID 2 image of simple, (d) The GC TCD image of simple

Reference

- [1] F.C. Anson, Application of Potentiostatic Current Integration to the Study of the Adsorption of Cobalt(III)-(Ethylenedinitrilo(tetraacetate) on Mercury Electrodes, *Analytical Chemistry*, 36 (1964) 932-934.