

Supporting materials

CO₂-Induced Fibrous Zn Catalyst Promotes Electrochemical Reduction of CO₂ to CO

Mengquan Guo ¹, Xiangxiang Li ¹, Yuxin Huang ¹, Linfa Li ¹, Jixiao Li ¹, Yiren Lu ¹, Yanhong Xu ^{2,*} and Lihong Zhang ^{1,*}

¹ Department of Catalysis Science and Technology and Tianjin Key Laboratory of Applied Catalysis Science & Technology, School of Chemical Engineering and Technology, Tianjin University, Tianjin 300350, China; gmq_0105@tju.edu.cn (M.G.); lixx_37@tju.edu.cn (X.L.); youningtdzhy@163.com (Y.H.) lithium@tju.edu.cn (L.L.) tokenobug@163.com (J.L.) luyiren@tju.edu.cn (Y.L.)

² Department of Materials Engineering, Xuzhou College of Industrial Technology, Xuzhou 221140, China

* Correspondence: xuyanh@mail.xzcit.cn (Y.X.); zlh_224@tju.edu.cn (L.Z.); Tel.: +86-150-6212-8662 (Y.X.); +86-150-2225-5828 (L.Z.)

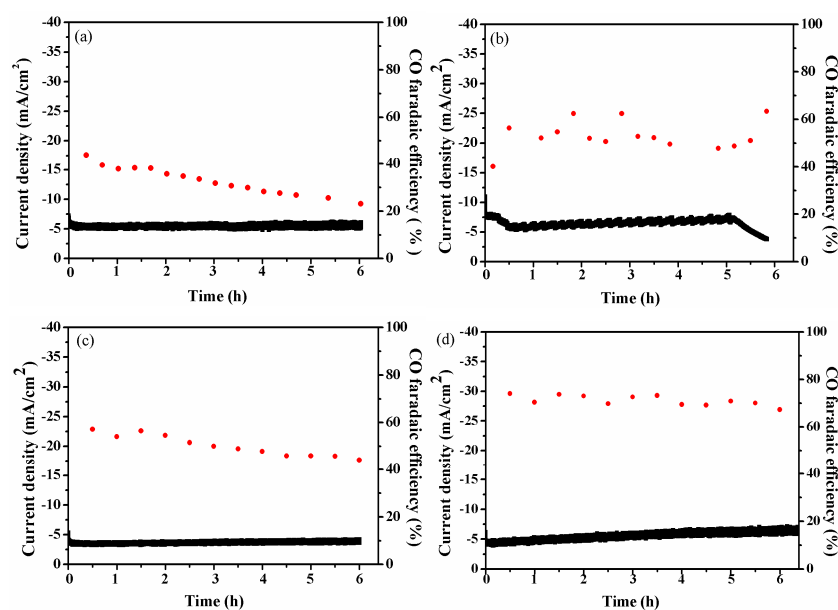


Figure S1. Current density and FE_{CO} for (a) Zn foil, (b) Zn-N₂, (c) Zn-H₂ and (d) Zn-CO electrodes during 6 h of long-time operation at -1.2 V vs RHE.

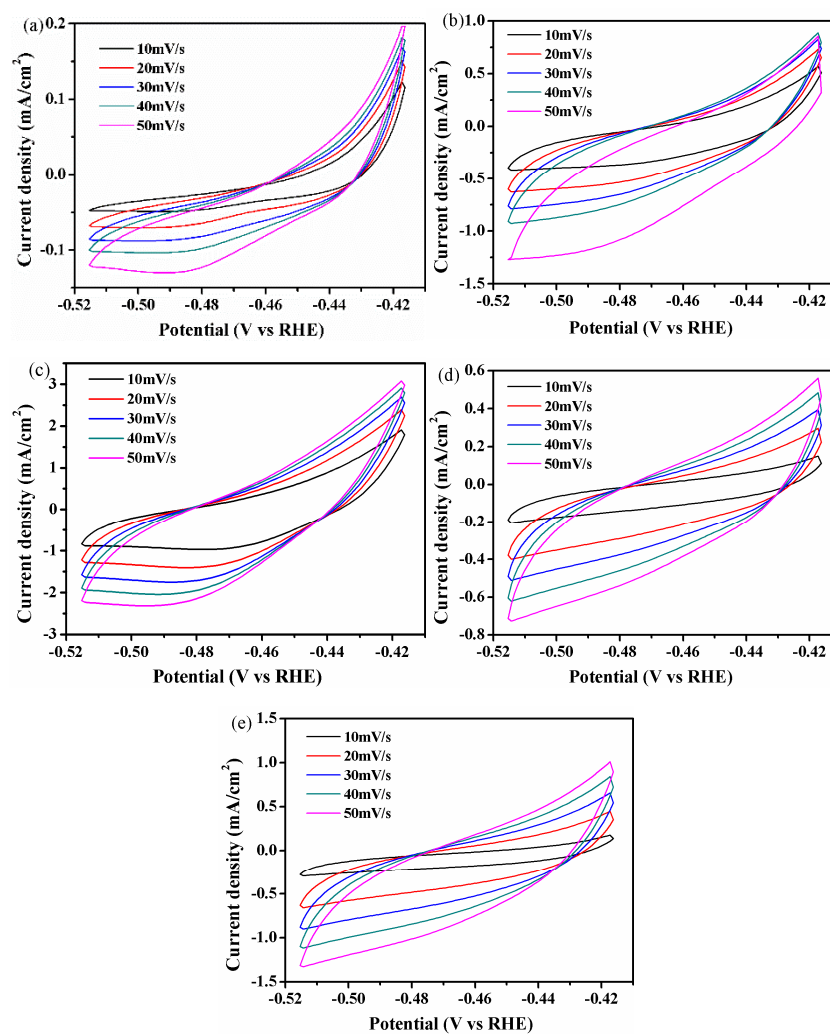


Figure S2. CV curves on (a) Zn foil, (b) Zn-N₂, (c) Zn-CO₂, (d) Zn-H₂ and (e) Zn-CO electrodes with a potential range from -0.415 to -0.515 V vs RHE in a N₂ bubbled 1 M Na₂SO₄ electrolyte.

The C_{dl} was determined by measuring the capacitive current associated with double-layer charging from the scan-rate dependence of cyclic voltammetric stripping. The scan rates were 10, 20, 30, 40 and 50 mV/s

The C_{dl} was estimated by plotting the $\Delta j = (j_a - j_c)$ at -0.4653 V (where j_c and j_a are the cathodic and anodic current densities, respectively) versus RHE against the scan rate, in which the slope was twice that of C_{dl} .

Table S1. The data of CO partial current density for Zn-CO₂ electrode.

Potential (V vs RHE)	CO partial current density (mA/cm ²)
-0.7	0.14
-0.8	0.52
-0.9	1.24
-1.0	2.22
-1.1	3.96
-1.2	6.14
-1.3	7.89

CO partial current density = Current density * Faradaic efficiency of CO

Table S2. The solubility datas of different gas in water ^[1].

Temperature (°C)	N ₂ (mL) ^a	CO ₂ (mL)	H ₂ (mL)	CO (mL)
0	0.02354	1.713	0.02148	0.03537
5	0.02086	1.424	0.02044	0.03149
10	0.01861	1.194	0.01955	0.02816
15	0.01685	1.019	0.01883	0.02543
20	0.01546	0.878	0.01819	0.02319
25	0.01434	0.759	0.01754	0.02142
30	0.01342	0.665	0.01699	0.01998

^aVolume (mL) of gas dissolved in 1 mL water measured under standard conditions.

Reference

1. Dean, J. A. *Lange's Handbook of Chemistry*, 13th ed.; Science: Beijing.