Supporting Information

Designing Effective Si/Ag Interface via Controlled Chemical Etching for Photoelectrochemical CO$_2$ Reduction

Yongpan Hu, Fengjiao Chen, Pan Ding, Hui Yang, Junmei Chen, Chenyang Zha and Yanguang Li*

Institute of Functional Nano & Soft Materials (FUNSOM), Jiangsu Key Laboratory for Carbon-Based Functional Materials and Devices, Soochow University, Suzhou 215123, China.

Correspondence to: vanguang@suda.edu.cn
Figure S1. (a) Side-view SEM image of e-Si/Ag etched for 35s; (b, c) corresponding Si and Ag EDX mapping of the all area in (a); (d) XRD pattern and (e) Ag 3d XPS of e-Si/Ag.

Figure S2. (a) SEM image of Si/Cu; (b) polarization curves of Si/Cu under 0.5 sun illumination in CO$_2$-saturated 0.5 M KHCO$_3$; (c) corresponding potential-dependent CO Faradaic efficiency of e-Si/Cu.
Figure S3. (a) Polarization curves of e-Si/Ag and pristine Si under 0.5 sun illumination in CO$_2$-saturated 0.5 M KHCO$_3$; (b) corresponding potential-dependent H$_2$ Faradaic efficiency of pristine Si.

Figure S4. (a) Potential-dependent H$_2$ or CO Faradaic efficiency of Si/Ti/Ag, and (b) the change of H$_2$ or CO Faradaic efficiency at -0.8 V over time.
Figure S5. (a) Surface changes of Si/Ti(10nm)/Ag(30nm) before and after 10 CV cycles; (b) polarization curves of Si/Ti(10nm)/Ag(30nm), Si/Ti(5nm)/Ag(5nm) and e-Si/Ag under 0.5 sun illumination in CO$_2$-saturated 0.5 M KHCO$_3$.

Figure S6. Potential-dependent CO Faradaic efficiency of e-Si/Ag etched for (a) 10 s and (b) 60 s.
Figure S7. Potential-dependent CO Faradaic efficiency of e-Si/Ag under different light intensities: (a) 0.2 sun and (b) 1 sun.

Figure S8. SEM images of e-Si/Ag after the long-term stability test.