Supplemental Information

Ag-Sb/Cu by Galvanic Replacement: Electrochemical CO$_2$ Reduction and Unveiling C$_3$+ Hydrocarbon Pathways

Sooyeon Bae, Seon Young Hwang, Gaeun Yun, Yunji Gwon, So Young Kim, Choong Kyun Rhee, Youngku Sohn*

Department of Chemistry, Chungnam National University, Daejeon 34134, Republic of Korea

* Corresponding author e-mail: youngkusohn@cnu.ac.kr
Figure S1. Amperometry i-t curves at −1.8 V (vs. Ag/AgCl) over Cu, Ag, and Sb electrodes in 0.1 M KHCO$_3$ and 0.1 M K$_2$CO$_3$ electrolytes (a, b, and c, respectively). Corresponding FEs of major reduction gas and liquid products (a1, b1, and c1, respectively). Corresponding FEs of C$_2$H$_6$ and C$_3$+ hydrocarbons (a2, b2, and c2, respectively).
**Figure S2.** Amperometry $i$-$t$ curves at various applied potentials (vs. Ag/AgCl) over Sb/Cu electrodes in 0.1 M KHCO$_3$ and 0.1 M K$_2$CO$_3$ electrolytes (a and b, respectively).
Figure S3. Amperometry i-t curves at various applied potentials (vs. Ag/AgCl) over Ag/Cu electrodes in 0.1 M KHCO$_3$ and 0.1 M K$_2$CO$_3$ electrolytes (a and b, respectively).
Figure S4. Amperometry i-t curves at various applied potentials (vs. Ag/AgCl) over AgSb/Cu electrodes in 0.1 M KHCO$_3$ and 0.1 M K$_2$CO$_3$ electrolytes (a and b, respectively). Corresponding ASF plots for C$_{2-4}$ hydrocarbons over AgSb/Cu electrode at −1.8 V (vs. Ag/AgCl) in 0.1 M KHCO$_3$ and 0.1 M K$_2$CO$_3$ electrolytes (c and d, respectively).
Figure S5. GC profiles for C$_3$+ hydrocarbons over AgSb/Cu electrode at $-1.8$ V in different electrolytes, different KHCO$_3$ concentrations, and different K$_2$CO$_3$ concentrations (a, b, and c, respectively). Corresponding C$_3$H$_8$/C$_3$H$_6$ ratios of the C$_3$ hydrocarbons (a1, b1, and c1, respectively).
Figure S6. FEs of C₂H₆ and C₃⁺ hydrocarbons over AgSb/Cu electrode at −1.8 V under dark and light conditions in 0.1 M KHCO₃ and 0.1 M K₂CO₃ electrolytes (a and b, respectively).
Figure S7. EDS profiles for selected Sb$_{30}$/Cu, Ag$_{30}$/Cu, and Ag$_{30}$Sb$_{30}$/Cu electrodes.
Figure S8. FE of main reduction products with error bars over selected Ag$_{30}$Sb$_{30}$/Cu electrode at $-1.8$ V (vs. Ag/AgCl) in KHCO$_3$ electrolyte with various concentrations.