Highly Selective CO_2-to-CO Conversion on Hybrid Silver/Organic Electrodes

LiSA LIQUID SUNLIGHT ALLIANCE

Scientific Achievement

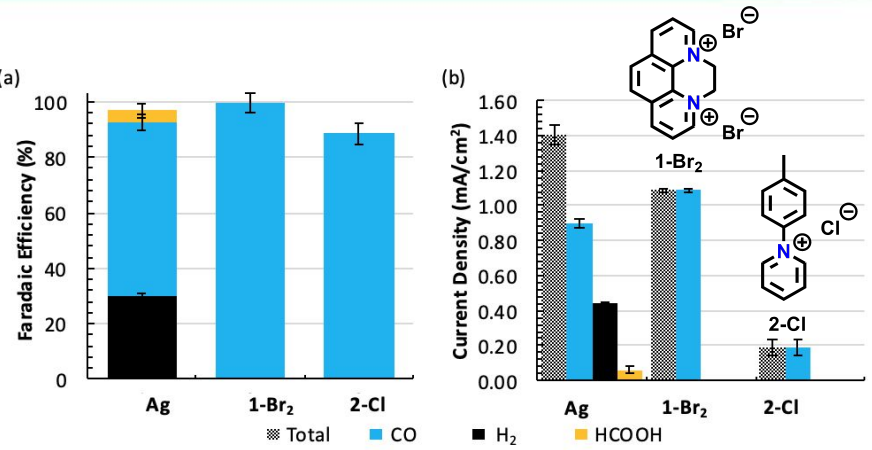
First selective conversion of CO_2 to CO (FE>99%) in neutral aqueous electrolytes using planar Ag electrodes and pyridinium-based additives.

Significance and Impact

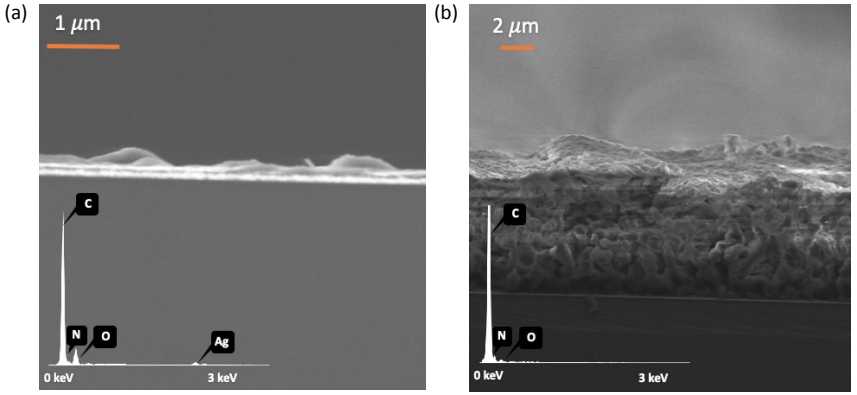
CO_2 electroreduction in aqueous electrolytes suffers from efficiency loss due to the competiti H_2 evolution reaction (HER). Developing efficient methods to suppress HER is a crucial step toward sustainable CO_2 utilization.

Research Details

- The films are conveniently generated at the surface of the Ag electrode during bulk electrolysis by *in situ* reduction of pyridinium-based organic additives .
- Electrokinetic studies demonstrate the impact of the film on the mechanism of CO_2RR: a proton transfer from HCO_3^- is involved in the RDS; electron transfer is more typically observed as the RDS on Ag surfaces.



*(a) Faradaic efficiencies and (b) total and partial current densities obtained during CO_2RR at −0.99 V vs RHE in a CO_2-saturated 0.1 M $KHCO_3$ electrolyte without or with 10 mM of either **1-Br$_2$** or **2-Cl**.*



*Cross-sectional SEM images and inserted EDS spectrum of a post-catalysis Ag electrode using additive (a) **1-Br$_2$** and (b) **2-Cl**.*

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