Researchers design novel hollow-fiber Cu penetration electrode for efficient CO_2 electroreduction

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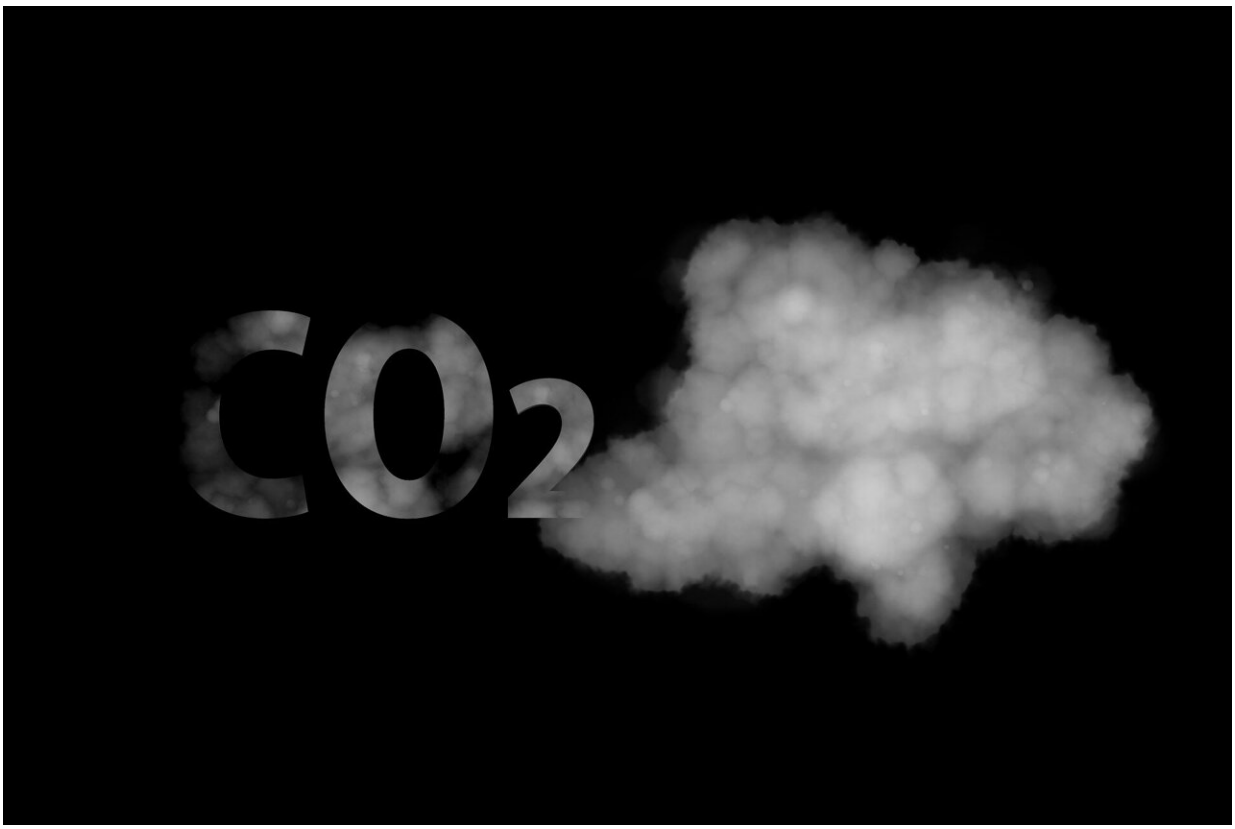

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Electrochemical conversion of CO_2 into value-added chemical fuels driven by renewable electrical energy has roles in reducing net CO_2

emission and in addressing energy consumption.

Although considerable progress has been made in CO_2 electroreduction, carbonate formation can cause serious CO_2 loss. CO_2 conversion in acidic electrolyte is an attractive way to overcome the problem of CO_2 loss, however, selective reduction remains a challenge.

In a study published in *Energy & Environmental Science*, a research team from the Shanghai Advanced Research Institute (SARI) of the Chinese Academy of Sciences designed a Cu hollow fiber penetration electrode to electroreduce CO_2 in strong acid with effective inhibition of hydrogen evolution reaction (HER).

By virtue of the unique penetration effect induced by Cu hollow fiber, abundant CO_2 molecules were supplied to Cu active sites. The Cu surface possessed enough high CO_2 coverage, which suppressed HER and facilitated CO_2 reduction to C_2^+ products.

Thus, a CO_2 single-pass conversion rate exceeding 51% with a C_2^+ Faradaic efficiency of 73.4% and partial current density of 2.2 A cm^{-2} were achieved in acidic solution (pH = 0.71). The performance of the Cu penetration electrode was approximated to or even exceeded those of the state-of-the-art Cu base catalysts.

This work represents progress in the design and development of new electrode configurations to realize CO_2 electroreduction to high-value C_2^+ chemicals with scalable applications.

More information: Chang Zhu et al, Selective CO_2 electroreduction to multicarbon products exceeding 2 A cm^{-2} in strong acids via a hollow-fiber Cu penetration electrode, *Energy & Environmental Science* (2023). DOI: 10.1039/D3EE02867D

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