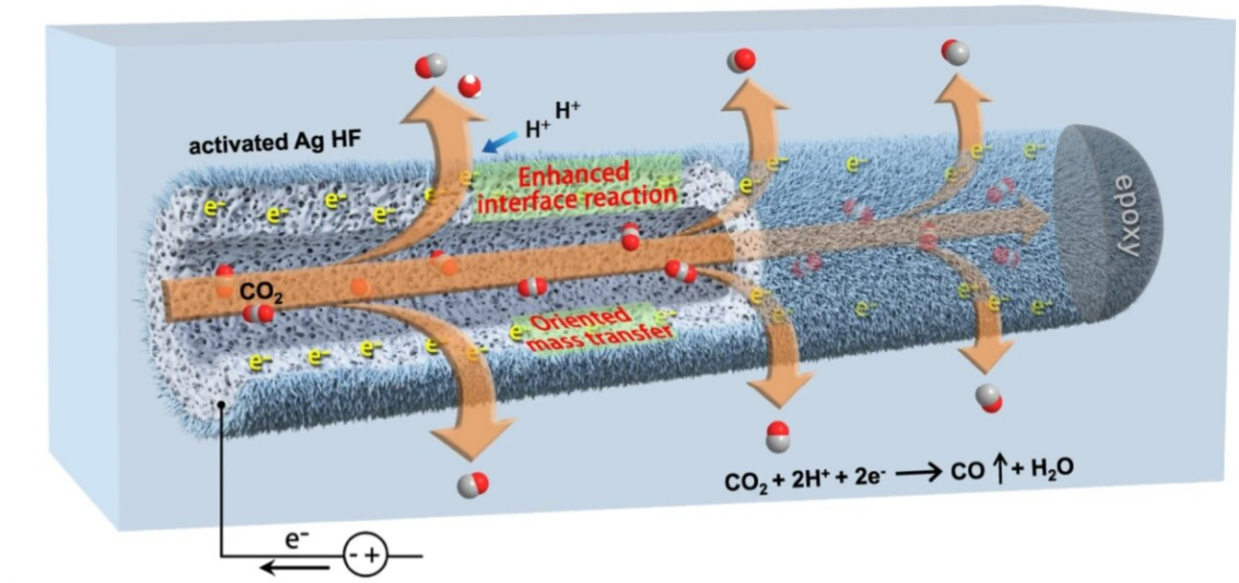
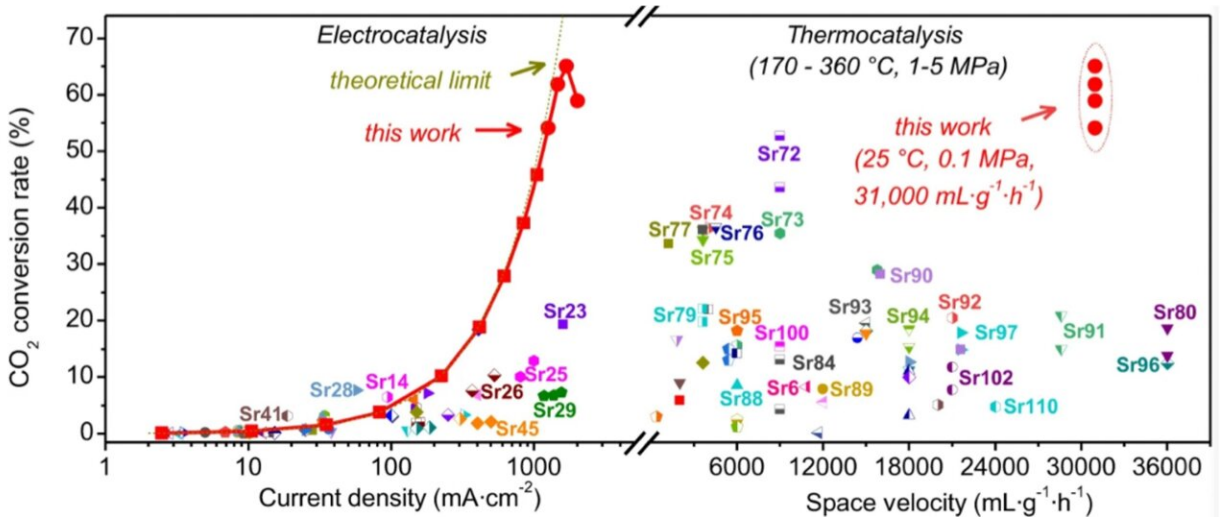
Novel silver hollow fiber boosts CO2 electroreduction

June 6 2022, by Li Yuan





Schematic illustration of hollow fiber electrode for boosting CO2 reduction to

CO. Credit: SARI

A research team led by Profs. Wei Wei and Chen Wei from the Shanghai Advanced Research Institute (SARI) of the Chinese Academy of Sciences have reported a hierarchical micro/nanostructured silver hollow-fiber electrode to boost CO_2 electroreduction.

The electrode reduces CO_2 to CO with CO_2 conversions exceeding 54% at a high space velocity of 31,000 mL $gcat^{-1}{\cdot}h^{-1}$ under ambient conditions, maintaining stable large current densities (~1.26 $A{\cdot}cm^{-2}$) and high CO faradaic efficiencies (~93%).

The results were published in *Nature Communications* on June 2.

The electrochemical conversion of CO_2 into carbon-based fuels and valuable feedstocks by renewable electricity is an attractive strategy for CO_2 abatement and renewable energy consumption that can help achieve the goal of carbon neutrality.

CO is the key component of syngas, a mixture of CO and H_2 that can be directly converted into various value-added chemicals via well-developed industrial processes such as Fischer-Tropsch synthesis, methanol synthesis, etc. Therefore, CO_2 electroreduction to CO is considered one of the most promising means of obtaining cost-competitive products. However, highly efficient CO_2 conversion with high space velocity under mild conditions remains a challenge.

The hollow-fiber electrode with hierarchical micro/nanostructures in this study is composed of only metallic silver (Ag) for electroreducing CO_2 to CO. Such a porous, hollow-fiber Ag electrode acting as a CO_2 disperser not only enhances three-phase interface reactions but also

guides mass transfers during electrolysis.

Electrochemical results and time-resolved operando Raman spectra demonstrate that enhanced three-phase interface reactions and oriented mass transfers synergistically boost CO production.

This result provides new opportunities for heightening three-phase interface reactions and mass transfer kinetics simultaneously. In addition, it demonstrates that the micro/nanostructured Ag hollow fiber can be an ideal industrial electrode with excellent durability, representing an encouraging advancement in CO_2 electroreduction that may lead to scalable applications.

More information: Shoujie Li et al, Hierarchical micro/nanostructured silver hollow fiber boosts electroreduction of carbon dioxide, *Nature Communications* (2022). DOI: 10.1038/s41467-022-30733-6

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