Researchers improve efficiency in carbon dioxide electroreduction

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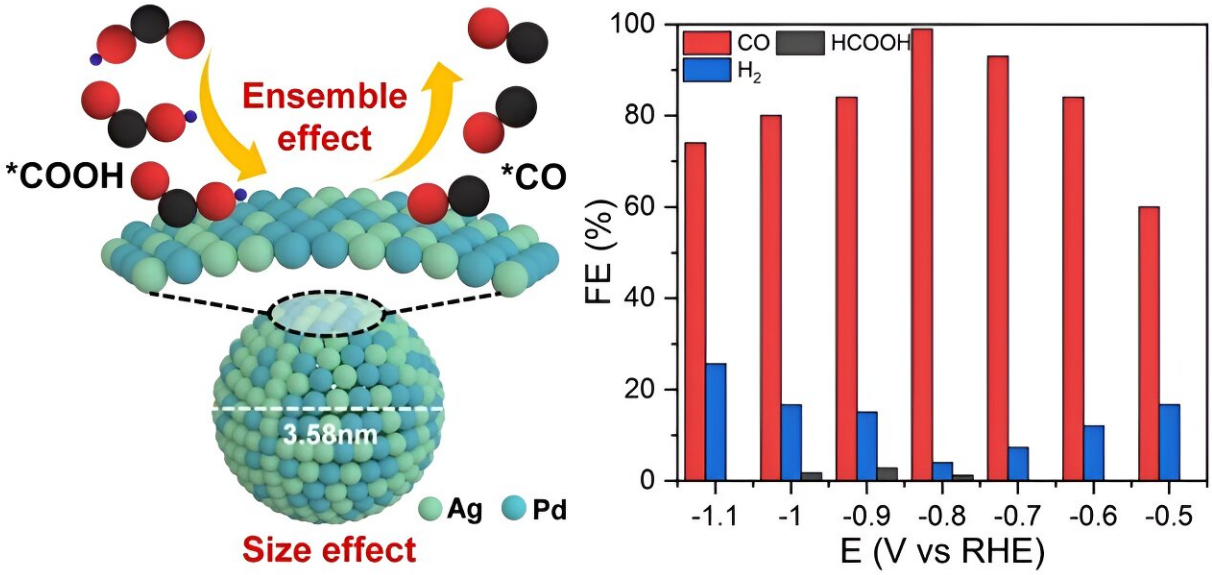

Schematic showing the coupling of size leverage and ensemble effect for promoting CO2 to CO electroreduction over fine AgPd nanoalloys. Credit: Zeng Qing

Researchers from the Institute of Process Engineering (IPE) of the Chinese Academy of Sciences and Yanshan University have proposed a strategy for boosting the CO faradaic efficiency in electrocatalytic CO_2 reduction reaction (eCO_2RR), an attractive option to address serious climate concerns and produce value-added chemical feedstock via coupling with renewable energies. The strategy is promising in producing

CO via eCO_2RR at ambient conditions.

The study was published in *Advanced Functional Materials* on Aug. 30.

Among the large variety of products, such as formate, CO, CH_4, C_2H_4, C_2H_5OH, and CH_3OH, converted from eCO_2RR, CO is of particular importance.

Unfortunately, although the eCO_2RR to CO has the advantage of being carried out at ambient temperature and pressure, it suffers from low faradaic efficiency due to more negative potential than theoretical value, i.e., overpotential, where the hydrogen evolution reaction (HER) is kinetically preferred.

"The key issue addressing the above-mentioned challenge is to design and develop efficient electrocatalysts that are more favorable for catalyzing eCO_2RR instead of HER," said Prof. Yang Jun from IPE, corresponding author of the study.

Theoretical calculations validated that the ensemble sites composed of Ag and Pd atoms could promote the eCO_2RR by either weakening the CO adsorption or enhancing the COOH adsorption. Based on this, the researchers reported a strategy to produce AgPd alloy nanoparticles with fine sizes for synergizing the ensemble effect and size leverage, achieving high CO faradaic efficiency of up to 98.9% in eCO_2RR with satisfactory durability.

"This work highlights the tailoring of active sites via atomic ensembles, which provides a practical method for rationally designing advanced electrocatalysts towards high-efficiency eCO_2RR," said Prof. Yang.

More information: Qing Zeng et al, Fine AgPd Nanoalloys Achieving Size and Ensemble Synergy for High-Efficiency CO2 to CO

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