

Enhanced electrochemical reduction of CO₂ over Cu-based catalysts modified with p-block elements

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The coupling of electrosynthesis technologies with renewable energy sources can potentially turn CO₂ emissions into a valuable feedstock for the production of fuels and chemicals while contributing to closing the anthropogenic carbon cycle.^{1,2} Copper foil electrodes prepared from the reduction of thick oxide films (OD Cu) effectively target the reduction of CO₂ to CO at moderate overpotentials.³ However, such electrodes display modest current densities, and their preparation on bulk metallic substrates makes them unsuitable for practical applications. In this context, we have recently shown that Cu₂O nanocatalysts prepared by a simple and potentially scalable solvothermal route are more active and selective for CO evolution than OD Cu electrodes under similar conditions.⁴ Additionally, the performance of these catalysts can easily be enhanced by introducing Sn and In into the Cu₂O matrix through the addition of the corresponding precursors to the synthesis medium (**Figure 1**). Based on this insight, we extend this methodology to evaluate the catalytic effect of introducing most non-hazardous p-block elements as modifiers, revealing a powerful strategy to tune the selectivity toward other eCO₂RR products while maintaining a high selectivity at reduced overpotentials.

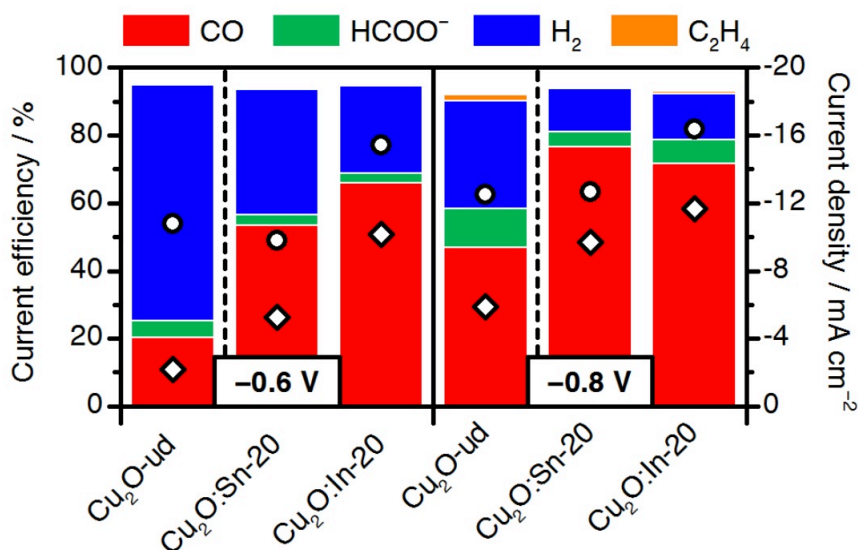


Figure 1 Current efficiency (bars), total current density (circles) and partial current density for CO (diamonds) in CO₂ electroreduction over unmodified (Cu₂O-ud) and Sn- and In-modified Cu₂O electrocatalysts prepared by a simple and potentially scalable solvothermal synthesis (potential indicated *versus* RHE in CO₂-saturated 0.1 M KHCO₃). The number in the codes indicates the Cu:Sn or Cu:In ratio of the catalyst.

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