Contribution ID: **47** Type: **Poster**

Boosted Ethanol Electrooxidation Using Rh Single Atom Decorated Pt Nanocubes

Thursday, November 14, 2024 1:00 PM (1h 30m)

Direct ethanol fuel cells (DEFCs) are increasingly garnering attention as portable power sources, owing to their superior mass-energy density compared to hydrogen and lower toxicity relative to methanol. Despite these advantages, achieving full electrooxidation of ethanol to produce 12 electrons per molecule remains a significant challenge, leading to suboptimal fuel utilization efficiency. In this study, we present a novel electrocatalyst composed of unalloyed, partially oxidized Rh single atoms dispersed on the surface of Pt nanocubes. This catalyst facilitates the complete oxidation of ethanol to CO2 at an unprecedentedly low potential of 0.35 V. Through in situ X-ray absorption fine structure (XAFS) measurements and density functional theory (DFT) calculations, we demonstrate that the Rh single-atom sites are pivotal in promoting C–C bond cleavage and efficiently removing *CO intermediates. This work not only elucidates the crucial role of unalloyed, partially oxidized single-atom catalysts (SACs) in the ethanol oxidation reaction (EOR) but also introduces a distinctive single-atom strategy that leverages low-coordination active sites on shape-controlled nanocatalysts. This approach offers a promising pathway to enhance both the activity and selectivity of complex catalytic reactions.

Paper submission Plan

No

Best Presentation

Yes

Contribution track

ICABU WG4. Applications of Particle Beams

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Session Classification: ICABU Poster Session

Track Classification: ICABU: ICABU WG4. Applications of Particle Beams