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Influence of the electrode-electrolyte interface on electrochemical CO₂ reduction reaction and hydrogen evolution reaction

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Propositions

accompanying the thesis

Influence of the Electrode-electrolyte Interface on Electrochemical CO₂ Reduction

Reaction and Hydrogen Evolution Reaction

1. Fundamental research is essential for developing sustainable alternatives to fossil fuel-based processes.
2. Understanding the factors that determine the selectivity and activity of electrochemical CO₂ reduction reaction (CO₂RR) at the molecular level is critical for their future application.
3. Atomically well-defined surfaces are highly desirable for fundamental research in electrocatalysis.
4. Catalyst modification with organic additives is a promising strategy to influence product selectivity of CO₂RR.

Chapter 2 of this thesis

5. In addition to the nature of the catalyst, the electrolyte composition, especially the cations, significantly impacts the activity and selectivity of CO₂RR.

Chapter 3 of this thesis

6. Optimized systems for CO₂R requires careful design of the electrolyte/electrode interface.
7. Understanding the activity trend for the hydrogen evolution reaction (HER) is equally crucial for the development of CO₂RR, as HER is a competing side reaction.

Chapter 4 of this thesis

8. Conducting CO₂RR in acidic media provides a promising approach to reduce the CO₂ consumption and improve energy efficiency, without compromising selectivity for C₂⁺ products.

Chapter 5 of this thesis

9. In both work and life, getting things done is often more important than making them perfect.
10. Patience, persistence, and hard work are the key factors to success.

Chunmiao Ye

Leiden, 5 December 2024