Exploring Ethanol Electro-Dehydrogenation Steps: A Combined RRDE and Numerical Simulation Approaches

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The mechanism of the ethanol oxidation reaction (EOR) remains a bottleneck for technological electrochemical applications of this molecule. Thus, understanding its dehydrogenation steps is key to addressing the controversial aspects of EOR. A rotating ring-disk electrode (RRDE) (Pt–Pt) was used to selectively detect proton species (H^+) at the ring [1]. This configuration enables the correlation between dynamic changes at the disk and the appearance of soluble species at the ring. Experiments were conducted in 0.1 mol·L^{-1} NaOH (pH 14) and 1 mol·L^{-1} EtOH, with the ring held at 0 V. The method explored kinetic instabilities by applying a galvanostatic mode at the disk and recording the ring current synchronously. Since oscillations are closely tied to the reaction mechanism, their observed occurrence between 0.7–0.9 V and the detection of H^+ current peaks at the ring support microkinetic modeling simulations [2], enabling mechanism cross-validation.

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