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Electro-oxidation of Ethanol in Different Conditions – A Fundamental Investigating of Sulphate Electrolytes Effects

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Catalytic energy conversion processes, such as the hydrogen evolution reaction (HER) from water, are essential for clean energy production and addressing fossil fuel dependency. However, the water oxidation reaction (WOR) faces significant thermodynamic obstacles, rendering it inefficient. The electro-oxidation of organic compounds, such as ethanol on a polycrystalline platinum (pc-Pt) electrode, presents a viable alternative due to its lower overpotential (0.6 V *vs.* RHE) compared to water (1.23 V vs. RHE). In this context, it is crucial to investigate the effects of different electrolyte ions. Sulfate, in particular, demonstrates significant kinetic control over alcohol oxidation. Furthermore, the introduction of chaotropic species stabilizes interactions between the catalyst and anion. Research results for the electro-oxidation of 1 M ethanol indicate higher current density and favorable electron transfer up to 75% (Na_2SO_4/$NaClO_4$) at pH 13. Similarly, in acidic media, the trend remains apparent, suggesting kinetic and mechanistic changes. These promising data highlight the SO_4^{2-}/ClO_4^- system, whose fundamental effects are being explored. Additionally, other pairs of anions are under investigation to extend interactive observations.

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