Decoupling parallel pathways during the oscillatory electro-oxidation of methanol on platinum

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As in the case of most small organic molecules, the electro-oxidation of methanol to CO_2 is believed to proceed through a so-called dual pathway mechanism. The direct pathway proceeds *via* reactive intermediates such as formaldehyde or formic acid, whereas the indirect pathway occurs in parallel, and proceeds *via* the formation of adsorbed carbon monoxide (CO_{ad}). Despite the extensive literature on the electro-oxidation of methanol, no study to date distinguished the production of CO_2 from direct and indirect pathways. Working under, far-from-equilibrium, oscillatory conditions, we were able to decouple, for the first time, the direct and indirect pathways that lead to CO_2 during the oscillatory electro-oxidation of methanol on platinum. The CO_2 production was followed by differential electrochemical mass spectrometry and the individual contributions of parallel pathways were identified by a combination of experiments and numerical simulations. We believe that our report opens some perspectives, particularly as a methodology to be used to identify the role played by surface modifiers in the relative weight of both pathways - a key issue to the effective development of catalysts for low temperature fuel cells.

R. Nagao *et. al. Phys. Chem. Chem. Phys.* 2012 DOI: 10.1039/C2CP00037G

2303004
20.09.12

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July 17, 2012

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This letter certifies your participation as a(n) Poster Presenter at the Gordon Research Conference on Oscillations & Dynamic Instabilities in Chemical Systems held July 15, 2012 - July 20, 2012 at Colby College in Waterville, ME United States.

Poster Entitled: Decoupling parallel pathways during the oscillatory electro-oxidation of methanol on platinum

For Dr. Nancy Ryan Gray, Director