

Complete Quantitative online Analysis of Methanol Electrooxidation Products *via* Electron Impact and Electrospray Ionization Mass Spectrometry

Wei Zhao, Zenonas Jusys*, and R. Jürgen Behm*

Institute of Surface Chemistry and Catalysis, Ulm University, D-89069 Ulm, Germany

ABSTRACT

We report on a novel approach for complete quantitative online product analysis in electrocatalytic reactions, combining electron impact ionization mass spectrometry (EI-MS) and electrospray ionization mass spectrometry (ESI-MS) for simultaneous detection of both volatile and non-volatile reaction products. The potential of this method for application in energy related electrocatalysis is demonstrated using continuous methanol oxidation over a commercial carbon supported Pt/C catalyst in a thin-layer flow cell. The overall reaction rate was followed *via* the Faradaic current, CO₂ formation was monitored mass spectrometrically *via* a membrane inlet system, and formaldehyde and formic acid were detected by ESI-MS after a derivatization-extraction-separation procedure introduced recently (W. Zhao et al, Anal. Chem. 82 (2010) 2472), providing quantitative data on the product distribution at different potentials. In a more general sense, this approach is applicable for a wide range of reaction at the solid|liquid interface or in liquid phase.

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