

Electrocatalytic oxidation reaction kinetics of ethanol on Pt electrode

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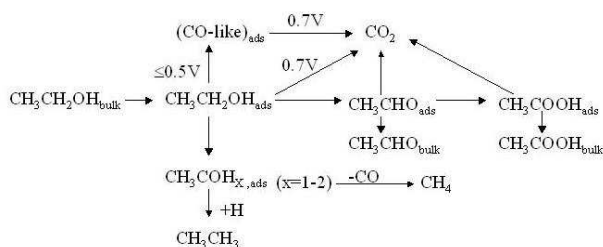
Low-carbon alcohols are currently viewed as one of the most promising renewable resources for replacing declining petrochemical reserves over the next decade. They are an attractive alternative fuel for fuel cell electric vehicles. The electrocatalytic oxidation of small organic molecules on noble metals is a current topic of interest in electrochemistry [1]. In the case of ethanol, which is a model organic molecule with two C atoms, most of the studies have been carried out on Pt electrodes [2-7]. The investigation on the electrocatalytic oxidation reaction kinetics of ethanol can promote the development of the anode electrocatalyst for direct alcohol fuel cell and indirect alcohol fuel cell. In this paper, the electrocatalytic oxidation reaction kinetics of ethanol is discussed in terms of reaction mechanisms and catalytic activity of the anode electrocatalyst. The desorption of adsorbed ethanol at polycrystalline Pt electrode were studied by using differential electrochemical mass spectrometry (DEMS).

Experimental

As an electrochemical cell, the one compartment with continual flow system thin layer cell was used, which is described in detail elsewhere [8]. 0.1 M EtOH in 0.5 M H₂SO₄ bulk oxidation on polycrystalline Pt electrode at different electrolyte flow rate were measured on the DEMS system. The CV and MSCV curve were recorded simultaneously.

Result and discussions

The typical CV and MSCV curve for the electrooxidation of ethanol on polycrystalline Pt electrode at different flow rate of electrolyte was illustrated in attached Figure. It can be seen, the flow rate of the electrolyte can affect the desorption and adsorption obviously, it may caused by the different diffusion process. CO_{ads}, CH₃CHO and CH₃COOH could be detected by comparing with different m/z curves. Several MSCV curves, such as m/z=15, m/z=29, m/z=43, m/z=44, were detected clearly. The reaction mechanisms of ethanol oxidation is as follow:



Acknowledgment

The authors are grateful for the financial support of this work by the NSF of China, under approval No. 50236010 and DFG Germany. It is also to be thankful for the support by the international cooperation program office under the Science and Technology Commission of Shanghai Municipality, under contract No.025207021 and Shanghai SHUGUANG program.

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