

研究论文

碱性介质中甲醇在铂电极表面吸附和氧化的电化学原位FTIR反射光谱和EQCM研究

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**摘要** 运用电化学循环伏安、原位FTIR反射光谱和石英晶体微天平(EQCM)等方法研究了碱性介质中甲醇在Pt电极表面吸附和氧化行为. 结果表明: 甲醇电氧化与溶液酸碱性有密切的关系. 酸性介质中甲醇在Pt电极上的CV曲线有两个正向氧化峰, 而碱性介质中只有一个正向氧化峰, 第二个氧化峰的消失可能是由于碱性介质中Pt电极在高电位下形成高氧化态的氧化物种毒化其表面引起的. 碱性介质中甲醇解离吸附产物的数量比酸性介质的明显减少, 对甲醇氧化的第一个氧化峰表现出更高的电催化活性. 目前实验条件下, 原位FTIR反射光谱检测到: 碱性介质中甲醇电氧化的最终产物是CO<sub>2</sub>和CO<sub>3</sub><sup>2-</sup>, 反应中间体主要为HCOO<sup>-</sup>物种. 从电极表面质量定量变化的角度提供了甲醇反应机理的新数据.

**关键词** [Pt电极](#) [甲醇](#) [碱性介质](#) [原位FTIR反射光谱](#) [电化学石英晶体微天平](#) [电氧化](#)

分类号

## EQCM and *in-situ* FTIR Spectroscopic Studies of Adsorption and Oxidation of Methanol on Pt Electrode in Alkaline Media

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**Abstract** The adsorption and oxidation of methanol on Pt electrode in alkaline media have been investigated by using cyclic voltammetry, Electrochemical Quartz Crystal Microbalance (EQCM) and *in-situ* FTIR spectroscopy. The experimental results demonstrated that the electrooxidation of CH<sub>3</sub>OH was closely relative to solution acidity. Only one current peak of methanol oxidation in PGPS was detected at -0.09 V, which illustrated the disappearance of the second current peak due to Pt electrode passivation in alkaline media. The magnitude of the dissociative adsorbate of methanol in alkaline media is smaller than that in acidic media. The main product, such as CO<sub>2</sub> and CO<sub>3</sub><sup>2-</sup>, was detected clearly and the reactive intermediates that were determined by FTIRs under experimental condition might be mainly HCOO<sup>-</sup> species. The EQCM studies provide quantitative results of surface mass changes during methanol oxidation, and have thrown new light in the elucidating methanol oxidation.

**Key words** [Pt electrode](#) [methanol](#) [alkaline media](#) [in-situ FTIR](#) [EQCM](#) [electrooxidation](#)

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