



纳米孔金膜电极：合金化/去合金化法制备及电化学性能 Nanoporous Gold Film Electrode: Preparation by Alloying/Dealloying Approach and Electrochemical Performance

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中文关键词: 去合金化; 纳米孔; 金电极; 甲醇

英文关键词: dealloying; nanoporous; gold electrode; methanol

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作者	单位
贾法龙	华中师范大学化学学院, 武汉 430079
罗建	华中师范大学化学学院, 武汉 430079
何悦	华中师范大学化学学院, 武汉 430079
张礼知	华中师范大学化学学院, 武汉 430079

中文摘要:

采用合金化/去合金化法在金电极表面制备出一层具有纳米孔结构的金膜, 其孔径约为15 nm。该方法首先在金电极表面电沉积一层锌, 再通过热处理形成合金层, 最后利用化学去合金化法去除合金中的锌。X射线衍射(XRD)结果表明在合金化过程中, 锌扩散进入金基体并形成了金-锌合金层。利用场发射扫描电子显微镜(FESEM)对去合金化得到的纳米孔金膜进行了形貌的表征, 结果表明合金化条件对样品的纳米结构有明显的影响。电化学测试结果表明, 经合金化/去合金化处理的金电极, 其表面粗糙度有明显的提高。这种金电极对甲醇具有较高的催化氧化活性, 在 $0.3 \text{ mol} \cdot \text{L}^{-1}$ 甲醇的KOH溶液中, 甲醇的氧化峰电流密度高达 $2.02 \text{ mA} \cdot \text{cm}^{-2}$ 。

英文摘要:

Nanoporous gold film with pore size of $\sim 15 \text{ nm}$ was fabricated directly on the surface of gold by an alloying/dealloying process, involving the electrodeposition of Zn on gold surface, thermal treatment to form alloy layer, and chemical dealloying of Zn in the alloy. X-ray diffraction (XRD) results show the deposited Zn into Au phase and an Au-Zn alloy layer formation during the alloying step. The morphologies of the samples were characterized by field emission scanning electron microscope (FESEM). It was observed that the thermal alloying condition had an obvious effect on the nanostructure of as-synthesized sample. Electrochemical tests indicate that the roughness of gold electrode is improved to about 65 after the gold electrode is treated by alloying/dealloying process. This nanoporous film gold electrode exhibits obviously high catalytic activity towards the oxidation of methanol. The oxidation current density of methanol was measured to be $2.02 \text{ mA} \cdot \text{cm}^{-2}$ in KOH solution containing $0.3 \text{ mol} \cdot \text{L}^{-1}$ methanol.

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