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# 生物功能电极**I: GOD**修饰电极的电化学活性

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摘要 以二环己基碳化二亚胺为活化剂将葡萄糖氧化酶(GOD)共价键接在玻碳电极上,伏安实验观察到酶与电极基体的直接电子传递,有观电子传递速度常数约为1s^-^1,过程归因于全酶中辅基FAD的氧化还原转变。Ag^+离子的存在强烈地阻碍酶辅基的还原,这与该离子抑制酶活性的机理可能有联系。Ag^+的抑制作用可由EDTA处理或电化学处理而解除,GOD电极对氧和苯醌的电还原有催化作用。测定了苯醌同还原态GOD的化学反应速度常数,并讨论用苯醌代替氧作为生物电催化中的电子传递体的优点。

关键词 反应动力学 活化剂 活性 电子传递 苯醌 电化学反应 化学修饰电极 碳化二亚胺 生物电化学 酶电极 共价键 固定化酶 葡萄糖氧化酶 玻碳电极

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## Biofunctional electrodes I. Electrochemical activities of GOD modified electrodes

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**Abstract** GOD was attached to glassy carbon electrodes by covalent binding with dicyclohexylcarbodiimide as an activator. The direct electron transfer between the immobilized enzyme and the electrode substrate was detected using both cyclic and differential pulse voltammetry, and considered as the redox transformation of FAD prosthetic groups in the holoenzyme. The apparent rate constant of electron transfer depends on the methods for enzyme immobilization, being roughly 1 s-1. The presence of Ag+ ions strongly interfered with electroredn. of the prosthetic groups; this may be related to the mechanism by which the ion inhibits enzymic activity of GOD. Ag+ inhibition can be released through treatment with EDTA or electrochem. treatment. GOD electrodes catalyze the reduction of oxygen and 1,4-benzoquinone, following an EC regenerative mechanism. The rate constant for the chem. reaction of benzoquinone with reduced GOD was measured, and the advantage of benzoquinone over oxygen as a mediator in bioelectrocatalysis was discussed.

**Key words** REACTION KINETICS ACTIVATING AGENT ACTIVITY ELECTRON TRANSFER BENZOQUINONE ELECTROCHEMICAL REACTION CHEMICAL MODIFIED ELECTRODE CARBODIIMIDE BIOELECTROCHEMISTRY ENZYME ELECTRODES COVALENT BONDS FIXED ENZYME GLUCOSE OXIDASE GLASSY CARBON ELECTRODE

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