pH型有机磷水解酶生物传感器的稳态模型*

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基金项目：

摘 要：

从分析pH型有机磷水解酶（OPH）生物传感器（简称OPH-pH型传感器）的工作原理出发，建立了描述稳态检测过程的扩散传质方程组，并根据方程组的特点将二阶微分方程组简化为二阶微分方程和非线性方程的求解，从而建立了OPH-pH型传感器的稳态模型。模型的计算结果给出了传感器性能的影响因素，可对传感器的设计提供一定的理论指导，自行制备的传感器实验结果与模型的计算结果基本吻合，验证了模型的正确性。关键词 有机磷水解酶 生物传感器模型 稳态检测

关键词：有机磷水解酶 生物传感器模型 稳态检测

A steady-state model of pH-based organophosphorus hydrolase biosensor

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Abstract:

On the base of the working principle of biosensors immobilizing organophosphorus hydrolase, a mathematic model of biosensors immobilizing organophosphorus hydrolase and pH electrode as the transducers is set up. The model combines the processes of diffusion and enzymatic reaction in the membrane. Solution of the differential equations describing the detection process of the biosensors summarizes the main factors influencing the response characteristics of the biosensors. Key factors influencing the system response, such as enzyme reaction order, Thiele modulus, and buffer concentration are discussed in detail. It is possible to obtain a good linear response by designing an enzyme electrode with a high enough Thiele modulus and by appropriately controlling the added buffer concentration. It is found that the model s in reasonable agreement with the experiment results.

Keywords: organophosphorus hydrolase, model of biosensor, steady-state detection

投稿时间：**2010-04-27**

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