

基于纳米磁珠修饰印刷电极的牛奶中三聚氰胺检测安培免疫传感器

作者: 干宁* 王峰 王鲁雁 李天华 杨欣

单位: (宁波大学材料科学与化工学院新型功能材料及其制备科学国家重点实验室基地, 315211)

基金项目: 国家自然科学基金青年基金(20805024), 浙江省自然科学基金(Y4080023, Y4080017)...

摘要:

共固定氯代邻菲罗啉双核铜配合物($\text{Cu}_2(\text{phen})_2\text{Cl}_2(\mu\text{-Cl})_2$, 简称Cu2L)和包被三聚氰胺抗体(anti MA)的 $\text{Fe}_3\text{O}_4/\text{Au}$ 胶(简称纳米磁珠)于丝网印刷电极(SPCE)表面, 构建了一种测定牛奶中三聚氰胺(简称MA)含量的安培免疫传感器。当该传感器在含MA溶液中温育时, MA和同时加入的HRP标MA二抗(HRP-anti MA II), 与电极表面的anti MA形成三元免疫复合物。该复合物上的HRP能催化 H_2O_2 还原, 并经过Cu2L传导在电极表面形成电流, 电流强度 I 与MA浓度在0.5~40和60~100 ng/mL范围内呈线性关系, 检测限为0.25ng/mL。在pH 6.2的PBS底液中, 该传感器制作简单、可抛弃, 对MA检测时间小于20min, 灵敏度为 $1\mu\text{A}\cdot\text{ng}^{-1}\text{mL}$, 明显高于酶联免疫吸附(ELISA)法; 可实现牛奶中MA免分离现场分析。

关键词: 氯代邻菲罗啉双核铜(II); $\text{Fe}_3\text{O}_4/\text{Au}$ 胶微粒; 三聚氰胺; 电化学免疫传感器

One Electrochemical immunosensor for Melamine in Milk Based on Nano Magnetic Particles Modified Screen Printing Electrode

Author's Name: Gan Ning^{1*} Wang Feng Wang Lu Yan Li Tian-Hua Yang Xin

Institution: (The State Key Laboratory, Base of Novel Functional Materials and Preparation Science, Ningbo University, Ningbo, 315211)

Abstract:

An electroimmunosensor for the determination of melamine(MA) in milk was proposed, which was prepared by co-immobilizing melamine antibody (anti MA), chlorophenanthroline binuclear copper($\text{Cu}_2(\text{phen})_2\text{Cl}_2(\mu\text{-Cl})_2$, Cu2L) and HRP marked $\text{Fe}_3\text{O}_4/\text{Au}$ colloid nano-particles coating on one carbon screen printing electrode. The detection of MA is based on the principle of sandwich immunoassay. When the sensor was incubated in the solution containing MA, HRP labeled antibody MA II (HRP-anti MA II). Then the sandwich immunocomplexes gradually generated on the electrode surface. The current increase results from the enhanced catalytic current of H_2O_2 reduction with the help of HRP labeled immune-compound, which leads to a linear increase of the catalytic efficiency of CuL by H_2O_2 in two MA concentration ranges from 1~40 and 60~100 ng/mL with the detection limit of 0.25ng/mL (3σ). The proposed method needs neither separation nor washing up step, which simplifies the immunoassay procedure by ELISA method, shortens the analytical time to 20 mins, and the sensitivity was $1\mu\text{A}\cdot\text{ng}^{-1}\text{mL}$, which provides a new promising platform to diagnosing the melamine in milk.

Keywords: Chloro phenanthroline binuclear copper(II); $\text{Fe}_3\text{O}_4/\text{Au}$ colloid microparticles; Melamine; Electroimmunoassay biosensor

投稿时间: 2008-11-21

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