

CdTe/CdS 量子点在Nafion/羟基磷灰石膜上的电化学发光及其应用于肌红蛋白的高灵敏检测

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摘要:

利用羟基磷灰石 (HAp) 和Nafion将CdTe/CdS量子点 (QDs) 修饰到玻碳电极上, 研究了固定在复合膜内的CdTe/CdS量子点的电化学发光行为。相比在水溶液中量子点在裸电极上的电化学发光, CdTe/CdS修饰到复合膜内后的电化学发光更加稳定, 且发光强度增加数十倍。在 pH 为6.5的磷酸盐缓冲溶液 (PBS) 中, 以三丙胺 (TPrA) 为共反应物, 基于肌红蛋白 (Mb) 能有效地猝灭量子点的电化学发光 (ECL) 强度, 建立了一种灵敏度较高的检测Mb的新方法, 同时我们探讨了Mb猝灭QDs电化学发光的可能机理。实验结果表明, Mb浓度在0.59 nM-10.59 nM 范围内, 分析信号 $\text{Log}(I_0-I)/I$ 与肌红蛋白浓度的对数 $\text{Log}[C_{Mb}]$ 有良好的线性关系, 检出限为0.12 nM ($S/N = 3$)。

关键词: CdTe/CdS量子点; 电化学发光; 羟基磷灰石; 三丙胺; 肌红蛋白

Electrochemiluminescence of CdTe/CdS Quantum Dots Immobilized on Nafion/HAP Hybrid Film and Its Application to Highly Selective Detection of myoglobin

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Abstract:

CdTe/CdS QDs were immobilized on glassy carbon electrode (GCE) using hydroxyapatite (HAP) and Nafion. Compared with the ECL intensity of QDs dispersed in aqueous solution with the bare GCE, and the chemically modified electrode could greatly enhance the ECL intensity of CdTe/CdS QDs in the presence of tri-n-propylamine (TPrA) as coreactant. A new ECL method has been developed for the determination of myoglobin (Mb) based on its quenching effect on the ECL intensity of CdTe/CdS quantum dots in pH 6.5 phosphate buffer solution (PBS), the result demonstrated that myoglobin could effectively quench the QDs emission based on the possible quenching mechanisms. Under the optimal conditions, the ECL intensity was decreased with the increase of Mb concentration in the range of 0.59 nM-10.59 nM with the detection limit of 0.12 nM.

Keywords: CdTe/CdS quantum dots; Electrochemiluminescence; Hydroxyapatite; Tri-n-propylamine; Myoglobin

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