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基于CdSe/ZnS核壳型量子点的高灵敏、快速细菌计数新方法的研究

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摘　要：

以乙酰丙酮镉和硬脂酸锌为前驱体，合成了巯基丙酸修饰的 CdSe/ZnS 核壳型量子点(QDs)。并将其作为荧光探针，以金黄色葡萄球菌(S. aureus)为目标细菌，建立了一种高灵敏的、简单快速的细菌计数新方法，并借助荧光显微镜成功的进行成像探测研究。通过考察量子点浓度、孵育时间等因素的影响，确定了细菌定量检测的最佳条件。在最优化的实验条件下，体系的相对荧光强度随细菌数量的增加而增大，该方法的线性范围为 102 ~ 106 CFU/mL，检测限为 102 CFU/mL。本方法有效克服了传统的细菌计数方法存在的缺陷，具有较高的灵敏度和较好的重现性（实际样品检测的 RSD = 3.6 - 8.1%），且操作简单、检测时间短、成本低，有很好的潜在应用价值。

关键词：CdSe/ZnS核壳型量子点；细菌计数；荧光探针；金黄色葡萄球菌

A highly sensitive and rapid bacteria-counting new approach based on CdSe/ZnS core/shell quantum dots

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Abstract:

The mercaptopropionic acid functionalized CdSe/ZnS core/shell quantum dots (QDs) were synthesized with cadmium acetylacetonate and zinc stearate as precursors. A high sensitive，simple and rapid bacteria counting approach was established by using QDs as a fluorescence label, Staphylococcus aureus (S. aureus) acted as detection target bacteria. The bacterial cell images were obtained using fluorescence microscopy. The effect of parameters such as concentration of CdSe/ZnS and reaction time are discussed. Under the optimized conditions, a linear relationship of the fluorescence peak intensity (Y) and the total bacterial count (X) was established in the range of 102-106 CFU/mL using the equation Y =427.586 X － 677.022（R =0.99649）with the detection limit of 102 CFU/mL. This new method shows a bright application prospect for detection of the total bacterial count due to its several advantages such as high sensitivity, reproducibility(RSD = 3.6 - 8.1%) technically simple, rapid and inexpensive while compared with traditional detection method.

Keywords: CdSe/ZnS core/shell quantum dots; the bacterial count; fluorescence label; Staphylococcus aureus

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