Evaluation of the application of thioglycolic acid-modified multinary quantum dots AgInS/ZnS in analysis

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Introduction

Luminescence semiconductor quantum dots (QDs) offer a rather new type of luminescent labels used for the visual and instrumental determination of analytes in various versions of chemical analysis [1]. The high quantum yield, photostability, wide excitation regions of these species make them ideal labels for analysis and ensure the development of procedures for the simultaneous determination of several substances and the attainment of low limits of detection. [2]. The toxicity of the starting materials, the high probability of fluorescence reabsorption at the improper selection of the concentration of the QDs, multistage character, and laboriousness of some approaches to the synthesis of QDs are the main difficulties in the application of QDs. Therefore, research into chemical analysis using QDs are of special interest, and the detailed consideration of the factors affecting QD properties and also of particular stages of their synthesis and features of their use is required [3].

In connection with this, the work aimed to the aqueous synthesis of hydrophilic AgInS/ZnS QDs using thioglycolic acid as a capping agent and evaluation of the application of multinary QDs in analysis.

Preparation of AIS/ZnS QD colloids and the size-selective precipitation

The influence of medium on the colloidal stability and PL intensity of AgInS/ZnS QDs

The influence of Cu²⁺, Cd²⁺, Zn²⁺ ions on the fluorescent properties of AgInS/ZnS QDs

Conclusion

1. Size-selected series of water-soluble luminescent mercaptoacetate-stabilized core/shell AgInS/ZnS QDs were produced by the precipitation technique with maximum emission fluorescence (PL) from 540 nm to 620 nm.
2. The influence of the medium on the spectral characteristics and colloidal stability of AgInS/ZnS fractions over time is estimated: QD fractions are most stable in water (5.2) and PBS buffer (7.5).
3. The effect of divalent ions on the PL intensity of the 2 fraction QDs was studied. It was shown that copper ions quenching the PL QDs and a linear dependence is observed in the concentration range up to 25 μM. At the same time, the addition of cadmium and zinc ions has practically no effect on the QD fluorescence intensity.

References


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