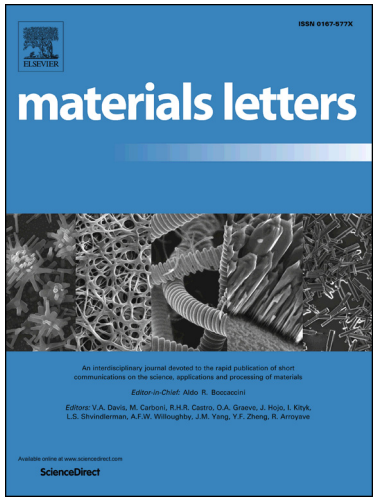

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One Pot Synthesis of Water Stable ZnO Quantum Dots with Binding Ability to Microbe

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Abstract

Semiconductor Quantum dots (QD) has gained substantial interest in biological applications during the past decades. ZnO QDs do not include heavy metal ions, are favorable in some applications. However, ZnO QDs obtained via classic sol-gel route are unstable in water and are lack of functional groups that could be conjugated with bioactive molecules. In this paper, ZnO quantum dots (QDs) were synthesized using Zinc methacrylate as starting material. Zinc methacrylate, N-Isopropylacrylamide, N-tert-butyl acrylamide and (N-(3-aminopropyl) methacrylamide hydrochloride were copolymerized and refluxed within alkaline ethanol solution; ZnO@polymer QDs were generated *in situ*. Composition and photoluminescence of the obtained QDs were investigated. The QDs were utilized for labelling of bacteria E. coli. Results indicate that the emission wavelengths of the QDs were tuned in the scope of 440 to 482 nm; the photoluminescence of the QDs was stable in water for 15 days, ZnO composition in the QD is 7.25%, size of the QDs were in the range of 2.5 - 4 nm, and the QDs have binding ability to E. coli.

Key words: ZnO, quantum dots, water stable, stimuli responsive, tunable wavelength

1. Introduction

Semiconductor quantum dots (QDs) are crystals with physical dimensions smaller than the exciton Bohr radius; research on QD has evolved from electronic materials science to biological applications [1]; QD bioconjugates are gaining widespread recognition in imaging, labeling and sensing [2]. ZnO is a wide band-gap (3.37 eV) semiconductor. The material has large exciton binding energy (60 meV) and high electromechanical coupling coefficients which give it the advantages over its competitor for applications in optical devices, piezoelectric devices, sensors and solar cells [3, 4]. ZnO is environment friendly, inexpensive, and exhibits preferential killing to cancer cells [5]. Classic route for synthesis of ZnO QDs

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