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Fluorescence spectroscopy of quantum dots in an optical tweezer

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Optical tweezers have found countless applications in the fields of physics and biology ever since its advent in 1986 by Arthur Ashkin. Using only focused light, optical tweezers are able to trap and manipulate microscopic particles. In this work, we investigate the possibility of combining the optical tweezer with fluorescence spectroscopy to develop an ultra-sensitive analytical instrument. We specifically focus on the feasibility of quantum dot nanoparticles used in conjunction with optical tweezers. In this work, we report on the synthesis of L-cysteine capped CdSe/ZnS quantum dots (QDs) and the coupling thereof to commercial carboxyl-modified beads. The QD-tagged beads which are two μm in diameter can be trapped with the optical tweezers and will be used as the fluorescence probe. A setup of an optical tweezer with a 532 nm laser was employed with which trapping of particles was demonstrated. The detection of fluorescence emission from the QDs that are covalently bonded to the beads was also demonstrated with the optical tweezer. This research, therefore, serves as a proof of concept for a sensitive analytical method that makes use of an optical tweezer in combination with fluorescent QDs.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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