

Abstract

Quantum dots [QDs], zero dimensional objects with three dimensional electronic confinement possesses size dependent spectral properties¹. Since their size is highly tunable, the spectral properties can also be tuned to suite the application². This has made QDs ideal candidates for sensors based on FRET [Förster Resonant Energy Transfer] mechanism where the emission energy of donor [QDs] must match absorption energy of acceptor. Depending on the absorption energy of the acceptor, QDs size distribution is manipulated. Rosenzweig.et.al has proposed a FRET based Protease sensor for MMP [Extracellular Matrix Metaloproteins] using CdSe/ZnS QDs [donor] bound to Rhodamine Red [RhR, acceptor] via tetra peptide RGDC³. Collagenase, a MMP cleaves RGDC which increases Fluorescence intensity of QDs and decreases that of RhR due to disruption of FRET. The simultaneous increase and decrease of fluorescence intensity of QDs and RhR respectively enables to quantify the MMP level in a given system. Li.et.al has proposed a Ag₂S QD system whose production is dependent on GSH [glutathione] for cancer cell detection as cancer cells have an elevated GSH level than normal cells⁴. They are proven to be less cytotoxic [MMT & Trypan Blue assays] and have a strong tissue penetrability of the NIR fluorescence making them good candidates for cancer cell detection.

1. Pedersen K. Quantum size effects in nanostructures. 2006;(August).
2. Quantum Dots. 1999:1-50.
3. Shi L, De Paoli V, Rosenzweig N, Rosenzweig Z. Synthesis and application of quantum dots FRET-based protease sensors. *J Am Chem Soc.* 2006;128(32):10378-9. doi:10.1021/ja063509o.
4. Tan L, Wan A, Li H. Synthesis of near-Infrared Quantum Dots in Cultured Cancer Cells. *ACS Appl Mater Interfaces.* 2014;6(1):18-23. doi:10.1021/am404534v.