Synthesis and Characterization of Photophysical and Colloidal Properties of Biocompatible Fluorescent Labels Based on Quantum Dots

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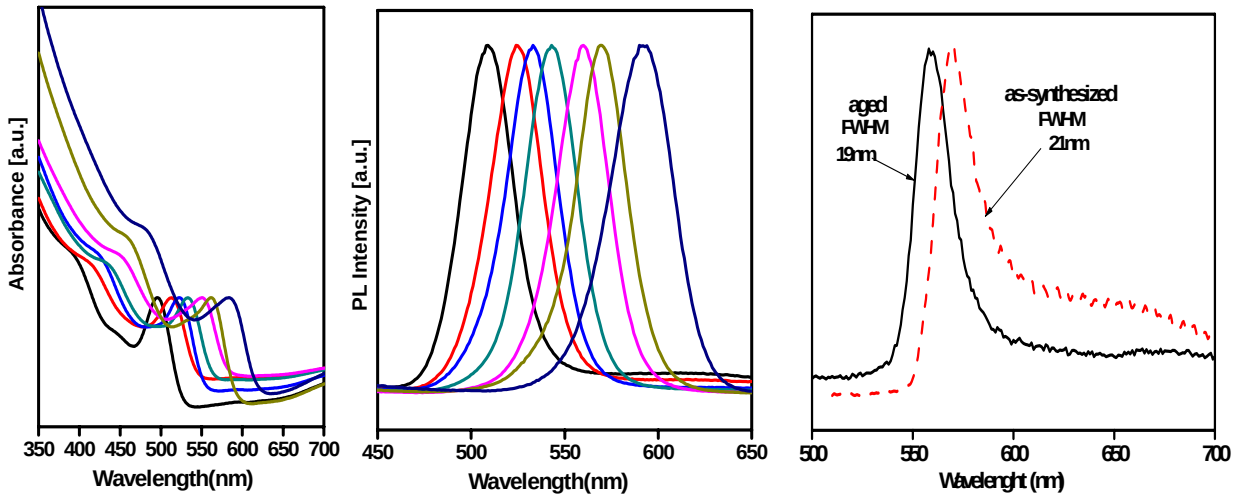
Background:
We have optimized Peng's [1] synthesis for fabrication of colloidal semiconductor nanocrystals. Their unique optical properties include bright luminescence, tunable narrow emission extending from VIS to NIR, broad excitation spectrum, high photostability and long fluorescent lifetimes (in the order of tens of nanoseconds). The nanoparticles are attractive as probes in experiments involving rapid detection or long observation times, multicolor and time-gated analysis.

Outcomes:
- Synthesis of biocompatible semiconductor nanocrystals for fluorescent labeling.
- Application of such fluorescent labels for high sensitivity protein detection
- Development of small size functionalized labels compatible with protein-protein interaction studies by means of FRET and FCS techniques.

Progress to date:
Core CdSe and CdSe/CdS core-shell nanoparticles with the following parameters have been synthesized:
- Peak wavelength in the 500-600 nm range
- FWHM emission as narrow as 19 nm without size selective precipitation
- Lifetimes up to 50 ns.

The aging studies revealed the improvement of optical propertie within few days after the synthesis accompanied by a slight blue shift of emission wavelength, and the disappearance of the defect states emission and narrowing of FWHM. Such aged nanoparticles have stable optical characteristics which have been followed over a period of 6 months.



Absorption, fluorescence spectra and ageing characteristics of synthesized core CdSe nanoparticles.

Funding is sought to:
- **Extend this study to develop functionalization process for binding specific proteins**
- **Application of functionalized nanoparticles in proteins interaction studies**

Timeline
Potential timeline for solving new problems in this area depends on the complexity of chemical synthesis, biocompatibility and the approach. We expect to optimize functionalisation within a year.