A Novel Ultrastable Zwitterionic Quantum Dot Synthesis

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This experiment investigates the synthesis, purification, and stability of encapsulated quantum dots. Quantum dots, specific types of nanoparticles ranging from 2-10 nm in diameter, emit specific spectra of light while observed under ultraviolet radiation. This experiment performed a novel room temperature quantum dot synthesis encapsulated by a patented micelle to study the efficiency and stability of the novel synthesis and encapsulating agent. The cadmium sulfide quantum dots were initially synthesized with a PCB-DSPE polymer used to encapsulate the cadmium sulfide nanoparticles. Such nanoparticles were tested under various conditions such as freeze dry lyophilization, dynamic light scattering, and ultraviolet emission spectra to test the stability of the cadmium sulfide core of the particles. Modern day electronics and drug delivery techniques utilize quantum dots for both their targeting and luminous characteristics. Modern day QDTVs are televisions that may be up to ten times brighter due to their use of ultra fluorescent quantum dots such as CdS QDs. Stability of the outer and core shells in these quantum dots is extremely important as cadmium ion is carcinogenic and instability may lead to health issues. With regards to drug delivery techniques, this novel synthesis may be used to encapsulate many different drugs that require target recognition technology to enter specific human organ systems. Thus, the stability of these nanoparticles en route to a desired target region must be very efficient so the drug may be delivered from the core only in the desired location. This novel room temperature quantum dot synthesis has proven to produce ultrastable quantum dots, as manifested through various biological, physical, and nanochemical stability test.

Awards Won:
Fourth Award of $500