Pulsed Thermal Processing of Self-Assembled Quantum Dot Structures

Nanomanufacturing Capital Investments

Funding Provided by the DOE Industrial Technologies Program

Cary 5000 UV-Vis-NIR Spectrophotometer
- Several newly synthesized QD nanocrystals have been measured for energy applications

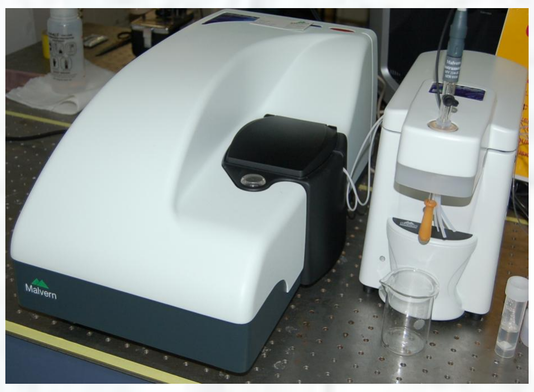
Microwave Synthesis
- Collection of fundamental synthesis data for nanomanufacturing process development

Microwave Reaction System
- Allows engineering process scale-up for using advanced microwave heating

Malvern Instruments: Zetasizer
- Enabling tool for nanoparticle process monitoring, understanding, and development of catalytic nanoparticles and quantum dots nanocrystals

FluoroMax-4 Spectrofluorometer

- Measure PL emission & excitation of samples.
- Real-time and temperature-controlled kinetics.
- 3D scan of spectra.

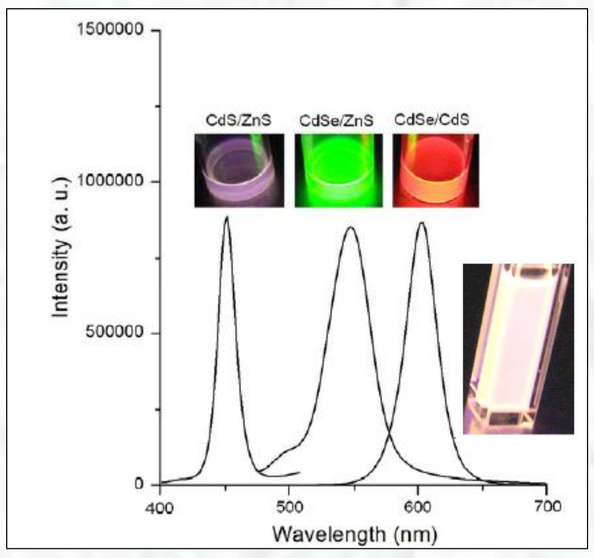


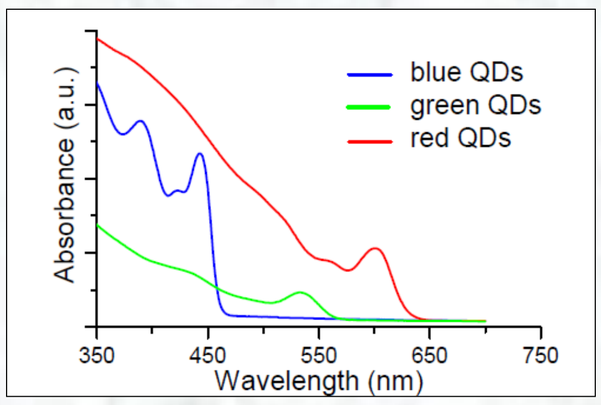
Applications for Solid State Lighting

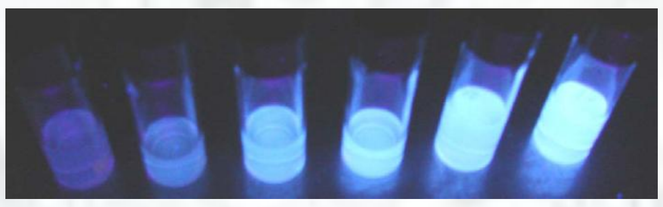
Project Objective:
- Develop a wet chemical process for the engineered self-assembly of quantum dots and to reduce defects through exposure to broad area thermal annealing. Combining the advanced synthesis and annealing techniques will greatly increase the photoluminescence efficiency of quantum dots

Development of RGB QDs-based SSL and solar cell materials
- Successfully synthesized CdSe/CdS, CdSe/ZnS, and CdS/ZnS core/shell quantum dots with red, green, and blue emissions. The three-color core/shell quantum dots can be mixed together to emit white light.

Synthesis of new, directly white-light emitting nanomaterials
- A new class of oxide-based material which generates a bluish white light was discovered. Characterization of this material is in progress.







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