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QUANTUM DOT SIZE AND SHAPE MODIFICATION

CHEMICALS

Light emitting semiconductor nanomaterials (quantum dots) with high color purity and stability that improve energy efficiency and color resolutions of display technologies.

TECHNOLOGY TYPE

Nanochemicals
Processing
Quantum Dots

STAGE OF DEVELOPMENT

- Demonstrated synthesis process and efficacy of quantum dots.
- Sample material produced.

IP PROTECTION

Nationalized PCT Issued in the United States, Europe, and Japan

Low-Temperature Synthesis of Colloidal Nanocrystals
US9273410B2

Continuation Issued in the United States

Modification of Colloidal Nanocrystals
US10290387B2

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Reference Numbers: U-4572, U-4573

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TECHNOLOGY SUMMARY

Conventional routes for synthesizing quantum dots use a high temperature, rapid injection process that makes producing large batches of quantum dots with consistent quality a challenge. Quantum dots grow faster in hot spots within the reaction vessel and slower in the cooler portions, thus broadening the size distribution of the final product and generating undesirably broad photoluminescence emission. Combining many small batches presents its own challenges because batch to batch variations cause the emission of the combined batches to broaden significantly.

A novel process relies on a perturbed, low temperature equilibrium between quantum dot growth and dissolution. The creation of a thermodynamic equilibrium provides control over the net nanoparticle growth rate, quantum dot size, and shape. This process keeps the nanocrystal in its original solvent, allowing the nanocrystal to retain the desired characteristics of high efficiency and tunable photoluminescence emission. The process also scales up readily from small to large batch sizes without compromising quality.

FEATURES AND BENEFITS

- Provides a cadmium free production option.
- Increases accuracy of wavelength targeting.
- Improves long-term stability.
- Allows scalable production.
- Increases color purity.

RECENT PUBLICATIONS

Siy, J.T., Brauser, E.H., Thompson, T.K., Bartl, M.H. (2014). Synthesis of bright CdSe nanocrystals by optimization of low-temperature reaction parameters. *Journal of Materials Chemistry C.*, 2:675-682. doi: [10.1039/C3TC32343A](https://doi.org/10.1039/C3TC32343A)

INVENTOR PROFILE

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