HIGHLY CONTROLLED CONTINUOS NANOCRYSTAL PRODUCTION AND ANALYSIS

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ABSTRACT

The most widely used methods for synthesizing semiconductor nanocrystals are "bottom-up", batch-style approaches. While these methods produce high quality products, they have several drawbacks that limit their efficacy including: (1) The volume of reactants is limited resulting in exorbitant time requirements to produce substantial quantities, and severe limitations on the experimental conditions used to optimize the process. (2) The particle growth kinetics are not always reproducible resulting in the need for post-production processing to achieve the size distributions required for most applications. (3) The local conditions in the bulk solution can't be accurately measured resulting in the inability to comprehensively understand the underlying kinetics. These drawbacks have led to the investigation of continuous flow reactor methods to produce semiconductor nanocrystals. Studies have shown that this approach can produce nanocrystals with quality comparable to batch methods and also precisely control parameters such as temperature, flow, and concentrations -- leading to nanocrystals with tunable sizes. Despite these advantages, there has not been an attempt to investigate the thermodynamics, kinetics, or commercial scale-up of continuous flow approaches.

To address these opportunities, researchers at UC Berkeley have developed a new continuos flow approach and reactor design for producing nanocrystals. These innovations represent a major advancement in the field in that they enable the probing of the underlying process occurring during nanocrystal synthesis, as well as the establishment of conditions capable for manufacturing a variety of particle sizes and morphologies.

APPLICATIONS

A scientific research tool for elucidating processes occurring during nanocrystal synthesis.

A method for producing nanocrystals on an industrial scale.

ADVANTAGES

Unprecedented control over nanocrystal size and morphology leading to superior flexibility

Entire reactor design is contained in a single SOI wafer leading to superior scalability

Novel thermal management system that can control temperature accurately and regionally

Flexible flow channel configurations enabling in depth study of the synthesis process

High quality production comparable to existing methods

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OTHER INFORMATION

CATEGORIZED AS

- » **Nanotechnology**
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