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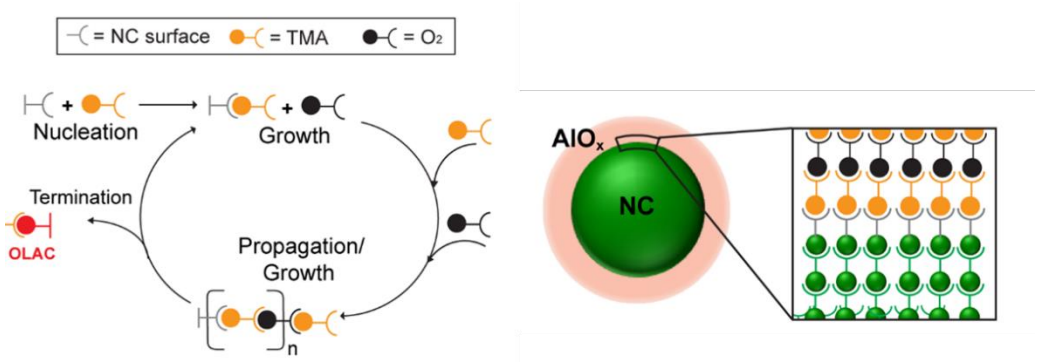
Licensing Opportunity

TTO – Technology Transfer Office

A colloidal atomic layer deposition method for producing Quantum dots



(**Left**) Schematic of the colloidal atomic layer deposition (c-ALD) synthesis. (**Right**) Sketch of the obtained core@shell nanocrystals (NCs).

Ref. Nr

TE 6.1973

Keywords

Colloidal atomic layer deposition, Core-shell nanocrystals, Semiconductor nanocrystals, Quantum Dots

Intellectual Property

PCT/EP2020/058695

Publications

J. Am. Chem. Soc. 2019, 141, 8254-8263

Date

18/10/2021

Description

The ability to tune thin oxide coatings by wet chemistry is desirable for many applications, yet it remains a key synthetic challenge. The innovation consists in introducing a general c-ALD synthesis to grow an alumina shell with tunable thickness around nanocrystalline cores of various compositions spanning from ionic semiconductors (i.e., $CsPbX_3$, with X = Br, I, Cl) to metal oxides and metals (i.e., CeO_2 and Ag).

Compared to gas-phase ALD, this new synthesis method has **the advantage of preserving the colloidal stability of the nanocrystalline core while controlling the shell thickness from 1 to 6 nm.**

Advantages

- Method occurs at room temperature and requires short reaction time
- Final particles stay soluble in solution or can be dried and used as powders, depending on the desired application
- Especially applicable to nanoparticles which are highly sensitive to polar environment (i.e. water or alcohols
- Allow to finely tune the size of the oxide shell around a metal containing nanocrystal core

Applications

- Biology: quantum dot probe
  - Dyes for single molecule tracking
  - Highly sensitive cellular imaging
  - Antibacterial properties
  - Förster resonance energy transfer (FRET) sensors
  - Tumor targeting under in vivo conditions
  - Inorganic fluorophore for intra-operative detection of tumors
- Photovoltaic devices: multiple exciton generation (MEG)
- Light Emitting Diodes (LED): quantum dots naturally produce monochromatic light (QD-LED or QLED)
- Quantum dot displays
- Photodetectors devices
- Photocatalysts: light driven chemical conversion of water into hydrogen as a pathway to solar fuel

Opportunities

- Licensing or collaboration