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Liquid-Phase Deposition of Silicon Nanocrystal Films (20120201, Dr. Uwe Kortshagen)

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Silicon Nanocrystal Deposition

A method to deposit colloidal silicon nanocrystal thin films using a liquid-phase process has been developed. The method lowers costs because the films are deposited unfunctionalized (no insulating ligand termination). The process allows for precise control of the size of the crystals; giving rise to control over the size dependent optical properties of the product. This is essential in applications such as photovoltaic solar cells, photodetectors, light emitting diodes (LEDs), lasers and transistors where light emission and absorption can be tuned.

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Plasma-Enhanced Chemical Vapor Deposition (PECVD) Alternative

Currently, deposition of silicon thin films is carried out in a high vacuum with plasma-enhanced chemical vapor deposition (PECVD). This batch dependent technique limits throughput. The liquid-phase deposition process described can be used with established deposition techniques such as inkjet printing, screen-printing, contact printing, meyer rod printing and doctor blade casting. The process is low cost, low temperature and scalable. Liquid-phase deposited silicon nanocrystal thin films can be deposited on a variety of flexible and inexpensive substrates such as plastics and foils.

BENEFITS OF LIQUID-PHASE DEPOSITION OF SILICON NANOCRYSTAL FILMS:

- Lowcost, low temperature and scalable.
- Continuous reel-to-reel manufacturing technology can be utilized for deposition.
- Compatible with established deposition techniques such as inkjet printing and screen-printing.
- Tunable silicon nanocrystal size allows for control of size-dependent optoelectric properties of the deposited film.

Researchers

Technology ID
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Uwe Kortshagen, PhD
Professor, Department Head, Mechanical Engineering
External Link (www.me.umn.edu)
Lance Wheeler