Free Standing Nanocrystal Thin Films

VANDERBILT UNIVERSITY
CTTC Center for Technology Transfer & Commercialization

Summary

Vanderbilt researchers have developed a process that creates free standing nanocrystalline thin films using a simple, robust and cost-efficient process. This paves the way for manufacturing conformal films of nanocrystals at a fraction of the cost compared to techniques currently used. The process could be applied in the manufacture of a number of products such as solar cells, supercapacitors, magnetic storage, semiconductor devices and catalysis.

Addressed Need

It would be advantageous to fabricate nanocrystal films as independent, isolated structures rather than in the current form of films that are permanently attached to bulk substrates. The current available methods of constructing freestanding nanostructured films suffer from the handicap of being laborious and unpredictable.

Technology Description

Thin nanocrystal films have been proposed for a diverse set of applications. But in order to reach their promised potential, the way in which they are currently assembled needs to be refined. Researchers at Vanderbilt University have developed a versatile approach to the creation of freestanding, macroscopic films comprised exclusively of nanocrystals. Since these films are independent of a supporting substrate and are without an external supportive matrix, many of their properties can be probed directly without the influence of substrate interactions. The current technique uses a sacrificial polymer layer to create freestanding nanostructured films. All substrate related interferences are thus obviated when using these.

Technology Features

- The nanocrystal films are entirely self-sustained, allowing for a more accurate probing of mechanical, structural, optical, and magnetic properties.
- With the use of a sacrificial polymer, the lateral dimensions of the freestanding films are able to be increased by nearly an order of magnitude—with the largest film sections approaching 1 cm in length.
- This new technique endorses rapid nanocrystal assembly, as well as further manipulation of the film as a freestanding object capable of being isolated or located elsewhere.

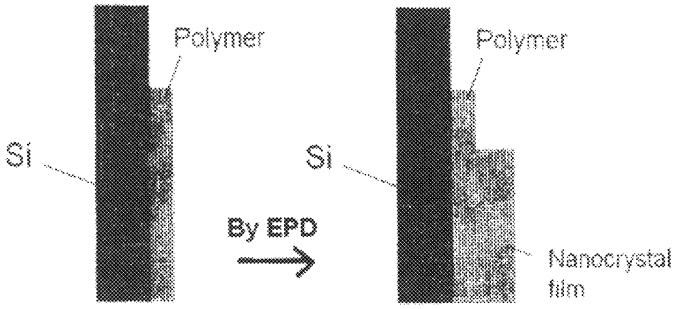

Figure 1: Using the present manufacturing approach, a nanocrystal film is built upon a sacrificial polymer to create large freestanding nanocrystal films approach 1 cm in length.

Intellectual Property Status

- U.S. Patent 8,529,745 has been granted
- Visit http://jameshdickerson.com/ for a detailed description of ongoing research programs, core research capabilities, and a list of publications.

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