Supraballs: Self-assembled Melanin Particles for Structural Color Production

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BACKGROUND

Conventional pigments are used to color materials and are subject to fading in ultraviolet light as well having the potential toxicity associated with conjugated organic pigments. Recently, there has been an interest in replacing these conventional pigments with so called structural colors which allow for the creation of a spectrum of nonfading colors without pigments. Moreover, these new structures create color and cause light to scatter. The creation of these new structures have been challenging, but researchers have developed a technique that can transcend these obstacles.

TECHNOLOGY DESCRIPTION

Researchers from the UC San Diego and the University of Akron (Ohio) have designed core-shell synthetic melanin nanoparticles (synthetic melanin core and silica shell nanoparticles, CS-SMNPs) and achieved bright structural colors. Firstly, driven by the demand for scalable production of structural colors, they have developed a facile one-pot reverse emulsion process to assemble CS-SMNPs into bright and noniridescent photonic supraballs.

The use of melanin as the core and silica as the shell can increase the brightness and saturation of supraballs because of its unique combination of melanin with high refractive index (RI) and silica with low RI, as well as broadband absorption of light by melanin. As a result, the supraballs can create a full spectrum of structural colors with the combination of only two ingredients, synthetic melanin and silica.

APPLICATIONS

The technology is suitable for use in the following: Inks, paints, 3D printing, cosmetics, UV protection, coloring plastics packaging,

food coloring, textiles, displays, sensors

ADVANTAGES

-Increased contrast of structural colors by use of synthetic melanin particles with high refractive index (1.74) and broad absorption spectra of silica, with lower refractive index (1.45).
-Melanin is biocompatible and is able to dissipate up to 90% of the ultraviolet (UV) radiation into heat within a nanosecond which makes colors last longer without fading.
-The use of silica is used to control the spacing between individual melanin particles to control the color.
-Developing a facile one-pot reverse emulsion process to form large scale supraballs.
-The solvents in self-assembly process are recyclable and cost-effective.
-Dynamic colors is able to be achieved by controlling conditions such as humidity, temperature, and other external fields.
-Supraballs may be stabilized by crosslinking and therefore stable in aqueous and organic solutions.
-Supraballs easily blended with polymers to produce colors for multiple use, such as 3D printing, cosmetics and inks.

INTELLECTUAL PROPERTY INFO

A provisional patent has been submitted and the technology is available for licensing.

RELATED MATERIALS

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OTHER INFORMATION

KEYWORDS

supraballs, synthetic melanin nanoparticles, structural colors, 3D printing, silica shell nanoparticles, CS-SMNPs

CATEGORIZED AS

- **Materials & Chemicals**
  - Nanomaterials
- **Nanotechnology**
  - Materials

RELATED CASES

2018-216-0

▶ Xiao M, Hu Z, Wang Z, Li Y, Tormo AD, Le Thomas N, Wang B, Gianneschi NC, Shawkey MD, Dhinojwala A. Bioinspired bright noniridescent photonic melanin supraballs. Sci Adv. 2017 Sep 15;3(9). - 09/15/2017

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