



Magneto-chromatic Spheres

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OTHER INFORMATION

KEYWORDS

Color displays, Signage, Bio-sensor,
Chemical sensor, Rewritable displays,
Colorimetric sensing, Magnetic field
sensor

CATEGORIZED AS

- ▶ **Optics and Photonics**
 - ▶ All Optics and Photonics
- ▶ **Environment**
 - ▶ Sensing
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 - ▶ Biological
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- ▶ **Nanotechnology**
 - ▶ Materials
- ▶ **Sensors & Instrumentation**
 - ▶ Biosensors
 - ▶ Environmental Sensors

RELATED CASES

2009-617-0

PATENT STATUS

Country	Type	Number	Dated	Case
Hong Kong	Issued Patent	1167673	01/15/2021	2009-617
European Patent Office	Issued Patent	2419479	02/05/2020	2009-617
United States Of America	Published Application	20130146788	06/13/2013	2009-617

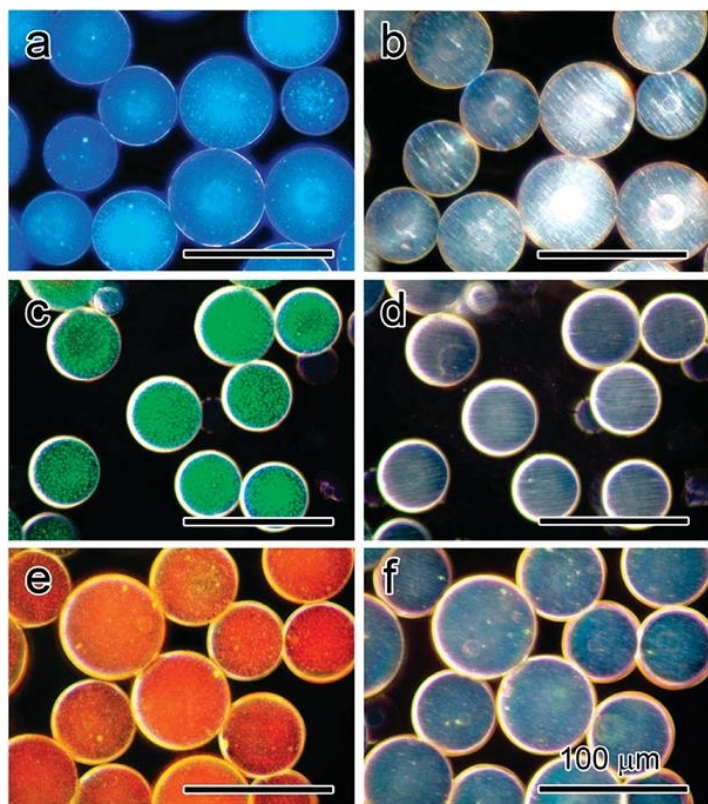
FULL DESCRIPTION

Background:

Colloidal crystals, which can be produced conveniently by self-assembling uniform colloidal particles, have been particularly useful for making responsive photonic materials. However, wide use of these colloidal systems in practical applications has been limited because of slow and complicated fabrication processes, limited tunability, slow response to external stimuli, and difficulty of device integration.

Current Invention:

Prof. Yadong Yin and his research team at UCR have developed a new type of magnetically responsive photonic system - photonic microspheres whose orientation and consequently photonic property can be easily controlled by using external magnetic fields. The excellent stability together with the capability of fast on/off switching of the diffraction by magnetic fields makes the system suitable for a variety of applications.



The attached image is optical microscopy images (500x) of magnetochromatic microspheres with diffractions switched between "on" (a, c, e) and "off" (b, d, f) states by using external magnetic fields. These microspheres are prepared using (a, b) 127, (c, d) 154 and (e, f) 197 nm Fe₃O₄@SiO₂ colloids.

ADVANTAGES

The significant benefits of this invention are:

- ▶ By rotating the microspheres, it is very convenient to control the orientation of the magnetic chains and thereby the diffractive colors using external magnetic fields.
- ▶ Many copies of microspheres can be produced using the simple process and can be tuned by external fields to collectively display uniform colors.
- ▶ Long term stability of optical response and improved tolerance to environmental variances such as ionic strength solvent hydrophobicity.
- ▶ Convenient incorporation into solid and liquid matrices without the needs for complicated surface modification.
- ▶ The magnetochromatic microspheres can be incorporated into a matrix which can thermally change between liquid and solid phases to produce a switchable/rewritable color display

▶ The excellent stability, good compatibility with dispersion media and the capability of fast on/off switching of the diffraction by magnetic fields makes the system suitable for practical applications.

SUGGESTED USES

Practical applications include:

- ▶ Color display
- ▶ Rewritable signage
- ▶ Bio-sensor
- ▶ Chemical detection
- ▶ Colorimetric magnetic field sensing

RELATED MATERIALS

- ▶ [Magnetochromatic Microspheres: Rotating Photonic Crystals](#)

INVENTIONS BY PROF. YADONG YIN

See all [inventions by Prof. Yadong Yin and his team at UCR](#)

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