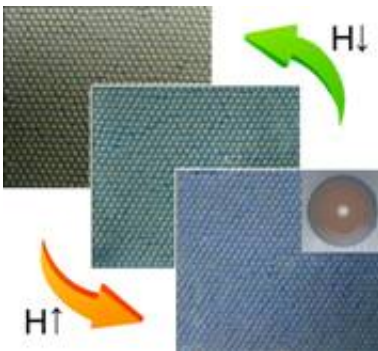


Magnetic chameleons: New displays that change color under the influence of magnets

March 16 2011



Chinese researchers have created microscopic capsules that change color when a magnetic field is applied. When the capsules are collected into an array, magnetic fields can be used to create colored patterns on an extremely small scale.

Many animals use tiny physical changes at their skin or surface to alter their [color](#). Chameleons do this by pumping slightly different amount of dye into the surface of their skins. Other animals, such as some beetles, fish and birds, have special arrays of light-reflecting cells that are moved apart very slightly by the injection or removal of a fluid, or by tiny stretching of their skin. These nanometer changes in spacing are enough to change the [wavelength](#) of light that is reflected and hence the color that we see.

Scientists have been able to replicate this effect to some extent using regular clusters of tiny spheres known as colloidal crystals. The spacing between the centres of the spheres determines the wavelength of [light](#) that is reflected and, hence the color of the crystal. Simple actions such as adding fluid (as described above) or swelling the size of the particles have been used to change the color.

If the spheres used are magnetic, then a [magnetic field](#) can be used to control the spacing between them, and, of course, the color. This phenomenon has been shown previously, but stable systems were not created and the color seen was very dependent on viewing angle.

Now, as described in the journal [Advanced Functional Materials](#), Zhongze Gu and coworkers at the Southeast University in Nanjing have created stable droplets of particles whose color can be tuned through a wide range and which does not depend on where the viewer stands.

Their breakthrough was to encapsulate clusters of magnetic spheres in a liquid within tiny, transparent resin beads. The beads are highly uniform and could be used as individual pixels in a display. Applying different magnetic fields causes the spheres within the capsules to move further apart or closer together, resulting in different colors. The picture shows the effect of applying different magnetic fields.

Another clever idea of Gu and his team was to use automated technology to create the capsules. Uniform sizes and composition are required if such materials are to be used as displays, and this was achieved by using microfluidic techniques, where reactions occur continuously as ingredients travel along the narrow channels of a very small-scale reactor. Tuning the flow rates of various reactants easily controls the capsules' size, shell thickness and shape.

The scientists are proud of their work and imagine that it could be

adapted to be used with electronic magnetic fields, using the full potential of the tiny scale of the microcapsules and leading to “more complex and interesting patterns.”

More information: C. Zhu, W. Y. Xu, L. S. Chen, W. D. Zhang, H. Xu, and Z. Z. Gu, “Magnetochromatic Microcapsule Array for Display”, *Adv. Funct. Mater.* 2011; DOI: 10.1002:adfm.201002296

Provided by Wiley

Citation: Magnetic chameleons: New displays that change color under the influence of magnets (2011, March 16) retrieved 25 April 2024 from <https://phys.org/news/2011-03-magnetic-chameleons-magnets.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.