Chemistry in our life

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2011/04/29

Carbon nanotubes in large panel displays

28 April 2011

US researchers have incorporated carbon nanotubes into organic light-emitting transistors (OLETs) to create devices that rival the performance of their silicon counterparts. This technology could lead to much larger flat screen televisions and displays, which are also cheaper to manufacture.

Organic light-emitting diodes (OLEDs) produce brighter light than liquid crystals and are cheaper to make than inorganic LEDs. This makes them a promising alternative for large flat screen displays.

Polycrystalline silicon transistors - semiconductor devices used to amplify and switch electronic signals - are used to make up the backplane of OLED electronic displays. However, it is difficult to make uniform polycrystalline silicon grains and this limits the size of display you can make.

Bigger, cheaper flat screen televisions could be on the cards thanks to an organic device that is both a light source and a transistor

Now a team of researchers, led by Andrew Rinzler at the University of Florida, Gainesville, has tackled this problem by adding a thin network of carbon nanotubes to a transistor. This transistor can perform the switching functions an electronic display needs at very low voltages. 'The goal is to allow people to build bigger screens. We have opened up the field to be able to exploit a whole new class of materials in these devices, to overcome the limitations of polycrystalline silicon,' says Rinzler.

The team took the design one step further and incorporated an OLED layer into the carbon nanotube-based transistor to produce an efficient OLET - a device that acts as both a transistor and light source for an electronic display. The device comprises a network of carbon nanotubes mounted on a thin dielectric layer. The device is sandwiched between two electrodes and the organic light emitting material sits on top.

Passing a small current through the device provides enough power to produce different coloured light. By adding different organic semiconductors the team were able to produce red, green or blue light without the need for a separate transistor and OLED.

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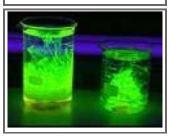

The Daily Puppy

Just like the internet, bacteria are hard to kill by cutting just a single pathway

They found that a small dose of minocycline alongside loperamide, a well-known anti-diarrhoeal drug, killed eight species of bacteria. They also found other potent combinations, which killed related bacteria or just a single species.

Wright says that this work is commercially interesting as novel or non-obvious drug combinations can be patented. Little drug development should be needed, he adds, so these combinations could be used in the near future to treat stubborn infections.

The emerging area of systems biology will offer new ways to counteract antibiotic resistance, Wright says. 'Cellular pathways are not an unlinked set of railway tracks,' he says. 'They are more like the internet with lots of interconnections, so you can't shut them down just by hitting one point in the pathway; that would be like trying to shut down the internet from your home computer.' He adds that combinations of drug treatments will attack the microorganism at several points simultaneously, reducing the risk of resistance. Bioactive non-antibiotic drugs may affect any point in bacterial cell processes and may aid antibiotic transfer into the cell.

Esa-Matti Lilius, an antimicrobial immune response researcher at the University of Turku, Finland, has eagerly anticipated such a systematic study. However, he points out: 'You have to be sure that the drugs go to the right place in the body to be active together; drugs may function well together in the laboratory, but in a patient this is a different matter.' Animal tests by the authors are promising, he adds, and clinical trials should be the next step.

Carol Stanier

RSC

Posted by esraa hashim at Friday, April 29, 2011 0 comments

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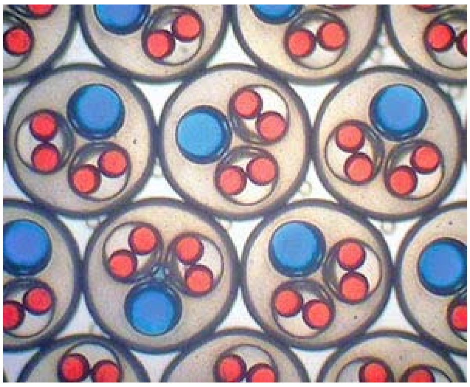
Multiple emulsion droplet design

27 April 2011

Scientists in China have developed a device that can control the production of multiple emulsion systems. This system could be used to encapsulate incompatible drug ingredients and to design multi-compartment materials, they say.

Multiple emulsions are liquid systems in which emulsion droplets are placed inside each other, each droplet smaller than the last, creating 'levels'. Microfluidic devices have been designed to produce such systems, but controlling the number, size and ratio of droplets at each level is difficult, especially when developing a system that has different types of emulsion droplets at the same level. Control over such multi-compartment levels would allow more precise encapsulation and the development of more advanced materials.

Liang-Yin Chu at Sichuan University and colleagues have designed a microfluidic device capable of producing multi-compartment multiple emulsions. Chu says: 'We hope the novel type of emulsions in our work will open a new gate for the applications of emulsions in the fields of template synthesis, synergistic delivery, micro reactions, bioassay and so on.'



Optical micrographs of monodisperse sextuple-component triple emulsions, containing one water-in-oil single emulsion and two oil-in-water-in-oil double emulsions

The team tested their system using different coloured oil droplets in water. The device - a droplet maker, connector and liquid extractor - can be arranged in different combinations to generate different emulsions. As the oil droplets move through the system, they merge in the main channel to form the multi-component emulsions.

Ho Cheung Shum, an expert in emulsions at the University of Hong Kong, in China, says: 'Such fine droplet engineering finesse creates new opportunities to explore topics such as reaction-on-demand, encapsulation of incompatible actives and templated assembly of artificial cell aggregates.'

Alberto Fernandez-Nieves, an expert in microfluidics at the Georgia Institute of Technology, US, is also impressed with the work. 'This beautiful work provides a very clever way to extend the applicability and uses of glass-based microfluidics,' he says.

The team now intend to explore the full potential of their device and promote its application in different areas.

Harriet Brewerton

RSC

Posted by esraa hashim at Friday, April 29, 2011 0 comments

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Pnicogens link up as new bond is discovered

26 April 2011

German researchers have discovered a chemical oddity - a new type of intramolecular interaction between group 15 atoms, which is as strong as a hydrogen bond. These interactions could be used to build supramolecular structures.

Pnicogens, group 15 elements, such as nitrogen and phosphorus, are well known for acting as Lewis bases, or electron donators. However, researchers at the University of Leipzig, Germany, have found that instead of repelling each other, two pnicogen atoms can attract each other, forming non-covalent bonds.