'There's Gold In Them That Exhausts!'

August 30 2007

A University of Leicester research team is working on a new technique for growing nanoparticles which could have extraordinary implications in electronics, medicine, the measurement of atmospheric air and the cleansing of car exhausts.

Dr Andrew Ellis and Dr Shengfu Yang, both of the University's Department of Chemistry, have discovered a niche way of making nanoparticles that cannot be formed in any other way.

Working with Professor Chris Binns and Dr Klaus von Haeften in the Department of Physics and Astronomy, they are developing a technique involving the use of helium nanodroplets.

These are droplets of superfluid liquid helium, consisting of thousands, even millions, of helium atoms loosely bound together.

Atoms and molecules can enter these droplets and can be assembled into structures that cannot be made by any conventional chemical synthesis.

Dr Ellis explained: "The technique gives us the ability to design nanoparticles layer by layer. These layers can be a solid, such as a metal, or a gas or liquid. So we could have a liquid or gaseous core with a solid shell round it.

"We are still exploring what uses this might have. We hope that it will enable us to design new types of catalysts for improved manufacture of chemicals. Other possibilities include the construction of nanoparticles

for storing information in smaller hard disk drives in PCs, or maybe even a useful way of introducing small drug molecules into specific locations in the human body."

The layer-by-layer growth of nanoparticles inside ultra-cold helium droplets will allow the researchers to synthesise entirely new classes of nanoparticles.

Some possibilities include:

Catalysis. An example is gold, which can already be obtained as pure nanoparticles with interesting properties as catalytic converters for cleaning carbon monoxide from car exhausts. Their efficiency depends on the size of the gold nanoparticles. Dr Ellis's research team can not only control the size of the nanoparticles, but can also attempt to 'tune' the scrubbing efficiency by coating the gold onto a 'core' built from a different material.

Medicine. It is possible to trap a drug molecule in a water-filled shell and wrap it in a thin protective layer. This could then be injected to the site of interest in a body and the drug could be selectively released at the point desired, for instance by illumination with light sufficient to disrupt the protective shell.

Source: University of Leicester

Citation: 'There's Gold In Them That Exhausts!' (2007, August 30) retrieved 27 April 2024 from https://phys.org/news/2007-08-gold-exhausts.html

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