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NEWSLETTER

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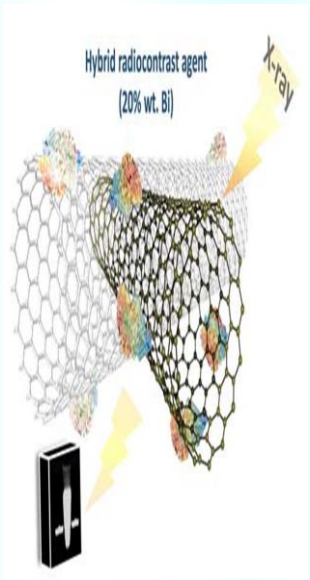
ADVANCEMENTS IN NANO TECHNOLOGY

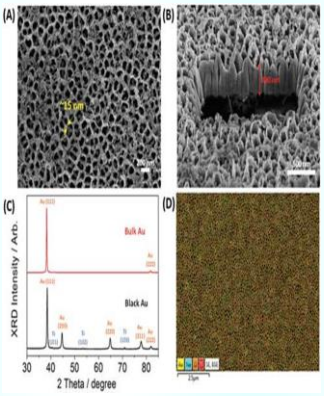
Cell-tracking nanomaterial agents get a boost

Researchers have synthesized a new and greatly improved generation of contrast agents for tagging and real-time tracking of stem cells in the body. The agent combines ultrashort carbon nanotubes and bismuth clusters that show up on X-rays taken with computed tomography (CT) scanners. The stable compound performs more than eight times better than the first-generation material introduced in 2013, according to the researchers. An improved compound of bismuth and carbon nanotubes called Bi4C@US-tubes, developed at Rice University, could enhance the ability to track stem cells as they move through the body and target diseases. The primary application will be to track them in stem-cell therapies to see if the cells are attracted to the site of disease, for example, cancer, and in what concentration. Magnetic resonance imaging is currently used for that purpose and it works quite well, but X-ray technology in the clinic is much more available. It's faster and cheaper, and it could facilitate preclinical studies to track stem cells in vivo. Bismuth is used in cosmetics, pigments and pharmaceuticals, notably as the active ingredient in pink bismuth (aka Pepto-Bismol), an antacid. For this application, bismuth nanoclusters are combined with carbon nanotubes chemically treated to shorten them to between 20 and 80 nanometers and add defects to their side walls. The nanoclusters, which make up about 20 percent of the compound, appear to strongly attach to the nanotubes via these defects. When introduced into stem cells, the treated nanotubes become easy to spot. The compound was tested in a CT scanner, which compared the abilities of empty nanotubes, the previous generation of Bi@US-tubes and the new compound. Hounsfield units are used to measure X-ray attenuation of contrast agents. The tests found about 188 Hounsfield units for plain ultrashort nanotubes, 227 for older Bi@US-tubes and 2,178 for the latest compound. Most soft tissues fall between 30 and 100 Hounsfield units, so cells labeled with the new compound were expected to stand out. Further testing showed the clusters hold tight to their nanotubes. The researchers detected no release of bismuth from the nanotubes tested at body temperature over 48 hours.



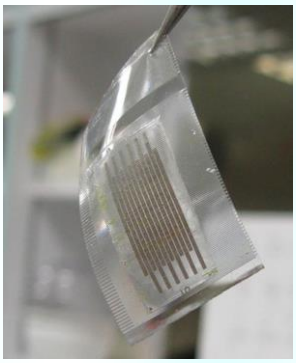
Black gold maximizes the light absorption of nanomaterial

Maximizing light absorption of nanomaterials has been an emerging research field in the recent years due to its attractiveness in a wide range of applications that involves conversion or utilization of solar energy. However, most of the concepts reported are based on multi-layered architecture inspired by optical impedance matching concepts that requires complicated non-scalable fabrication process such as electron beam lithography. Efforts on maximizing light absorption via nanostructuring remain scarce. A group of researchers in Australia is now one of the first to report such a material – a nanolayer of black gold. The most exciting result in this work is the ability to create gold surfaces that are nanostructured and appears black to human eyes due to its broadband high absorption of the visible light. It can be fabricated over large area surfaces in a robust and cost-efficient manner. Furthermore, it also exhibits the flexibility to adhere to arbitrary surfaces that warrants its attractiveness to a wide range of photo-related applications. Most importantly the fabrication process is not limited to only gold; researchers have also demonstrated the fabrication of black nickel using a similar method. The researchers strongly believe that this current study could provide a new paradigm for the use of highly absorbing metal nanostructures to effectively harvest the entire visible spectrum for photo-related applications such as solar fuel production, photo-detection and photovoltaics. In this present work, the team demonstrates a black gold film of merely 400 nm in thickness exhibiting as a broadband super absorber that is capable of absorbing >92% of the incident light energy up to 600 nm. The black gold film is fabricated by a simple, cheap and scalable template-assisted PVD, which makes it highly attractive and versatile to advance the field. The black gold film consists of high aspect ratio and closely packed gold nanotubes with a tapered wall thickness and high surface area exposed.



Stretchy supercapacitors power wearable electronics

Supercapacitors, developed in the 1950s, have a higher power density and longer life cycle than standard capacitors or batteries. And as devices have shrunk, so too have supercapacitors, bringing into the fore a generation of two-dimensional micro-supercapacitors that are integrated into cell phones, computers and other devices. However, these supercapacitors have remained rigid, and are thus a poor fit for soft materials that need to have the ability to elongate. In this study, researchers sought to develop a micro-supercapacitor from graphene. This carbon sheet is renowned for its thinness, strength and conductivity. Graphene can be flexible and foldable, but it cannot be stretched. The researcher's first step was to make graphene micro-ribbons. Most graphene is produced with physical methods, like shaving the tip of a pencil, but researchers use chemistry to build his material. The have more control over the graphene's structure and thickness that way. It's very difficult to control that with the physical approach. Thickness can really affect the conductivity of the electrodes and how much energy the supercapacitor overall can hold. The next step was to create the stretchable polymer chip with a series of pyramidal ridges. The researchers placed the graphene ribbons across the ridges, creating the wave-like structure. The design allowed the material to stretch without the graphene electrodes of the superconductor detaching, cracking or deforming. In addition, the team developed kirigami structures, which are variations of origami folds, to make the supercapacitors 500 percent more flexible without decaying their electrochemical performance. As a final test, Chen has powered an LCD from a calculator with the stretchy graphene-based micro-supercapacitor. Similarly, such stretchy supercapacitors can be used in pressure or chemical sensors. In future experiments, the researchers hope to increase the electrode's surface area so it can hold even more energy. The current version only stores enough energy to power LCD devices for a minute.



NANO PRODUCTS

LA Science Anti Hair Loss Serum

The product is from Lifestyle Aesthetics Ltd., UK. LA Science Anti Hair Loss Serum will help extend the growth phase of hair for a thicker looking, healthy head of hair. Unlike many systemic hair loss products, its patented nano technology delivery system uses an active peptide combination to deliver the formula directly to the root of the problem. When applied, it increases blood flow to the scalp to condition the hair and follicles, making it a powerful weapon to help fight hair loss. The LA SCIENCE anti-hair loss products have combined two amazing, clinically proven technologies, delivery of growth factor mimicking peptides and a unique encapsulated nano system infusing the base of the follicles with active ingredients to produce healthier hair and extend the anagen (growth) phase of the hair cycle.

Agera nano eye lift

This product is from the company AGERA medical formula, UK. Agera nano eye lift is formulated using tiny particles called "nanosomes" that encapsulate these powerful anti-ageing ingredients and ensure their penetration into the deepest layers of the skin. These nanosomes are suspended in a liquid.