

# Gold in the News

## Antibacterial Nanocomposite Coatings with Gold and Silver Nanoparticles

The potential use of antimicrobial surface coatings ranges from medicine to the construction industry and the food packaging industry. Silver is known as one of the oldest antimicrobial agents and has been commercially used effectively against different bacteria, fungi and viruses. Researchers in Germany have now developed a new method for producing antibacterial metal/polymer nanocomposite coatings, where silver and gold nanoparticles are incorporated in a thin surface layer. The new material shows a greatly enhanced antibacterial efficiency of the thin films.



Dr. Vladimir Zaporozhchenko, from the Chair for Multicomponent Materials at the University of Kiel in Germany, has explained that the well-known antibacterial activity of silver is greatly enhanced by depositing an additional very thin layer of gold clusters. The much more effective release of silver ions from the coating is attributed to the combination of clusters of silver with clusters of the nobler gold.

The results are presented in a recent paper, titled "Physico-chemical and antimicrobial properties of co-sputtered Ag-Au/PTFE nanocomposite coatings", that was published in the September 11, 2006 online edition of *Nanotechnology*.

Read more at <http://www.newswiretoday.com/news/9131/>

## Gold-Palladium Coated Polypropylene Grafts Reduce Infection

Recent work published in the *Journal of Surgical Research* (see (2006), **131(1)**, 73-79) suggests prosthetic graft infection with *S. epidermidis* can be prevented by coating the graft with gold-palladium or gold.

The use of non-absorbable mesh grafts in both abdominal wall defects and inguinal hernias are impossible in the presence of contamination. The recent study was conducted for evaluation of the efficiencies of polypropylene mesh grafts coated with gold and palladium-gold. Grafts were implanted below the musculoaponeurotic layer at inguinal region of rats. The least amt. of bacterial growth was detected in the samples obtained from gold-palladium coated grafts, whereas the highest rate of growth was found in samples of bare grafts. The superficial surgical site infection rate was 0% in gold-palladium coated, 30% in gold-coated and 100% in naive polypropylene group. The bacterial growth rate from wound cultures confirmed the superficial surgical site infection rates in all groups.

## Oxonica Licences Gold Nanoparticle Technology

Oxonica plc, a leading international nanomaterials group, has announced that it has signed a licence agreement for its Nanoplex™ technology with BD (Becton, Dickinson and Company), a leading global medical technology company headquartered in New Jersey, USA.



Oxonica's Nanoplex™ technology is based on gold nanoparticles with a unique label on the surface of the particle. This "tag" can be attached to a wide range of biological markers from infectious diseases, such as flu, through to cancers. These diseases can then be identified by way of the tag being "visualised" using a laser-based reader through a phenomenon known as Surface Enhanced Raman Scattering (SERS). The technology can provide ultra-sensitive and simultaneous detection of a number of diseases in the same test (multiplexing). The ability to deliver high levels of multiplexing in a simple format gives the technology advantages over current diagnostic techniques, which typically use fluorescent and chemiluminescent markers.

## Gold Used to Detect Pesticides in Water

Scientists from the Indian Institute of Technology (IIT) have found what appears to be a solution to detecting and eradicating pesticides from water using gold. T Pradeep and A Sreekumaran Nair are reported to have patented technology to use gold and silver nanoparticles to filter pesticides from water. They claim that the nano-particles bound up the residual pesticides from flowing water by means of adsorption. The pesticides apparently changed colour after being adsorbed. Eureka Forbes, a water purifying company, sponsored the research and helped them to patent the technology and have acquired a licence to use the technology. It is set to roll out products featuring the technology soon. PJ Reddy, Director of Aquamall Water Solutions Limited, a subsidiary of Eureka Forbes, said initially they would integrate the technology into their high-end products.

## Nano Company Finds Market for Gold

Gold nanoparticles are now being used by a leading nanotechnology company in a range of toiletry products including soap. Korean nanotechnology company Nano-Vision Tech has recently been assigned with an International Nomenclature Cosmetic Ingredient (INCI) designation for its 'Nano gold' material. The assignment was made by the industry body The Cosmetic, Toiletry and Fragrance Association (CTFA). Nano-Vision Tech are supplying the 'Nano gold' for use in soap, hair tonic and face masks.



## Nanophotonics with Gold

A gold-based optical switch for nanophotonic devices has been developed by material scientists in the US. In photonics, lightwaves, or photons, are used in optical circuits in the same way as electrons flow in electronic circuits. Nanophotonic devices control the flow of light and can be used in high-speed optical communications.

Philippe Guyot-Sionnest and colleagues at the University of Chicago have made nanoparticles whose optical properties can be precisely tuned. They say the particles could be used as a switch in an optical circuit.

The researchers made gold nanorods coated with silver selenide or silver sulphide (silver chalcogenides) by chemically plating the gold surface with silver and then exposing it to sulphide or selenide in an oxidising environment. The nanorods have a resonance frequency that can be tuned between 600 nanometres (visible light) to 2000 nanometres (infrared light). Varying the thickness of the silver chalcogenide layer changes the resonance frequency of the particles and gives the material its on-off switch effect.

## Possible New Cancer Tests Using Gold

Cancer researchers have a nanoparticle-based tool for more quickly and accurately detecting the presence of specific microRNAs, a development that could lead to new diagnostic tests for cancer.

Dr Robert Corn at the University of California-Irvine, led the team of investigators that has developed a novel assay for microRNAs. This new assay, which is about 50 times more sensitive than the methods used currently to detect miRNAs, uses gold nanoparticles and surface plasmon resonance imaging to detect attomole amounts of microRNAs. This sensitivity is sufficient to detect microRNAs in biological samples, even those containing large amounts of other RNA molecules.

This work is detailed in a paper titled, "Attomole microarray detection of microRNAs by nanoparticle-amplified SPR imaging measurements of surface polyadenylation reactions." This paper was published online in advance of print publication. An abstract is available at the journal's website. [View abstract.](#)

On a similar topic, The US government is to hand over \$3.8 million to fund further research into early cancer detection using gold nanotechnology.

The \$3.8 million grant awarded to Fairway Medical Technologies will go towards funding additional research into the detection of breast and prostate using a laser optoacoustic imaging technology. Fairway is hoping to prove that optoacoustic imaging can locate tumours tagged with gold nanorods bound to antibodies against cancer-specific receptors. Gold nanoparticles have so far proven extremely useful in hunting down cancerous cells in the body in order to allow for faster detection and more successful removal of tumours. Fairway president Jim Meador said: "Our research under this grant will go a long way toward determining whether the gold nanorods will be beneficial in tagging the tumours in reducing cancer mortality by providing sensitive, inexpensive, convenient and safe molecular-specific technology for cancer therapy."

## Gold-based Gas Sensor Available for Commercial Development

Simon Fraser University (SFU) has developed a working prototype of a novel gold-based vapochromic gas sensor with high sensitivity and strong visible (UV-Vis) and infrared (IR) detection channels. The sensor can function as either a high-end fixed IR gas detector, or a low-cost dosimeter safety badge or tube. The production of the sensing medium is readily achieved using commercially available starting

materials. Detectable materials include ammonia and amines at parts per billion (ppb) IR detection limits, and other VOCs at parts per million (ppm) IR detection limits. Additional information is available from SFU's PCT patent application that has been filed (WO/2006/039817).

Those parties interested in conducting confidential discussions with a view towards potential licensing of this exciting technology in any or all jurisdictions and/or field(s) of use should contact **Sacha Mann at s\_mann@sfu.ca** or (604) 268-6818.