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Silver News

Silver Coated Sutures Fight Wound Infections

Ten percent of patients globally will die from infections they contracted while in healthcare facilities.

More than 20 percent of health-related infections in U.S. patients, especially those who have undergone major surgery, are related to bacterial growth on wound-closing areas around stitches (known medically as 'sutures,') according to the U.S. Centers for Disease Control and Prevention. Moreover, the World Health Organization estimates that worldwide one in every 10 affected patients will die from these Healthcare-Associated Infections (HAI).

While these infections are usually treated with antibiotic drugs, if available, many infections have become drug resistant, leading to higher-needed doses although sometimes that treatment is ineffective.

To prevent bacteria build-up on sutures, a team of researchers affiliated with the National Autonomous University of Mexico (UNAM), has developed a highly stable form of nanosilver which they used to coat suture material. The results yielded a nearly perfect bacteria mitigation rate for several of the most common infections found on stitching used to close patient wounds.

> **"Nanosilver is increasingly being incorporated into various everyday applications, ranging from cosmetics to pharmaceuticals."**

"Our approach to the production and coating of the suture line is both straightforward and noninvasive, ensuring that the intrinsic properties of the material are not compromised," wrote Ravichandran Manisekaran, Ph.D, principal scientist of Nanostructures and Biomaterials, at the National School of Higher Education (ENES-Leon), a group affiliate of UNAM. "Upon contact with negatively charged microorganisms, the positively charged nanosilver releases its ions, initiating a sequence of events that culminate in the rapid antimicrobial effect and suppression of growth."

The group experimented with several suture materials such as medical-grade silk and found that a common polymer exhibited the strength, flexibility and silver-retaining properties they desired. Manisekaram

added: “Nanosilver is increasingly being incorporated into various everyday applications, ranging from cosmetics to pharmaceuticals. As such, our nanoparticle design and development can potentially be scaled up to combat superbugs in the near future, while simultaneously addressing the ongoing debate regarding the negative aspects of nanomaterials, which has been a topic of discussion among researchers.”

Extremely High-Frequency Antennas for Wearables, Other High-Tech Devices Produced by Nanosilver Inkjet Printer

Ultrawideband (UWB) radio communications systems are growing in popularity because their extremely high frequencies, ranging from 3.1 to 10.6 Gigahertz (the U.S. FM broadcast band, by contrast, extends from about 88.5 to 107.9 Megahertz) can handle large amounts of data quickly and have the ability to aim signals accurately. In addition, transmitters and receivers can be made small, easily fitting the confines of satellites, home network systems and wearables.

Producing antennas for such high frequencies requires pinpoint accuracy and is usually done by etching metal, often silver, to form intricate patterns on plastic. However, etching techniques usually require harsh chemicals, so engineers in China and Germany have joined forces to build these precise and tiny antennas using silver inkjet printing. This method does not use environmentally injurious chemicals and yields precise configurations.

These exact antenna configurations are crucial if the device is to operate efficiently at a specific frequency. In addition, by producing precisely laid-out shapes, the device can filter out unwanted signals that may be operating on close frequencies.

The researchers, writing in a journal article, concluded: “An antenna prototype was created on a flexible [plastic] substrate via inkjet printing, which results in signal radiation and the desired properties in the targeted UWB frequency band, making the antenna a good candidate for usage in flexible or wearable communication devices. The research is expected to provide guidance for the development of flexible/wearable antennas using low cost, environmentally friendly and highly efficient manufacturing processes.”

New Method Tested for Recycling Silver from Used Solar Panels, Other E-Waste

University of Helsinki

Postdoctoral Researcher Anže Zupanc tested organic solvents on crushed circuit boards, successfully extracting silver, gold and copper.

As silver is increasingly being used in electronic devices such as smartphones and tablets, methods to extract the metal instead of tossing it into an e-waste pile after use is growing in importance. Some current recycling techniques such as ‘roasting,’ that require high heat, not only use large amounts of energy but can require potentially dangerous chemicals. Researchers at the University of Helsinki are trying a different method that not only extracts silver but also gold and copper in separate stages by using safe organic solvents. Not only do the solvents separate out the metals, but the solvents can be recycled for further use once they’ve done their job.

In their tests, the scientists took e-waste such as used printed circuit boards, along with end-of-life solar panels – both of which are high-volume consumers of silver – and crushed them. Then they exposed the particles to different solvents such as choline chloride (a compound used in poultry feed), urea and lactic acid (found in cow’s milk). The silver, gold and copper were each dissolved by using a different solvent. Grinding was not necessary in all cases.

“With careful monitoring of the reaction parameters, our systems are applicable to real-life substrates such as printed circuit boards, gold fingers (gold-plated connectors at the edge of printed circuit boards) and waste solar panels without grinding pretreatment,” the researchers noted in their published report in Angewandte Chemie International Edition, a journal of the German Chemical Society (GDCh). They added: “The approaches developed in this work seem promising for scaling up because of overall moderate energy consumption and application of inexpensive and recyclable compounds . . . We anticipate that our novel approach will assist in guiding the development of contemporary methods for recycling of multi-metal waste substrates and support the security of noble metal supply.”

SI Podcast Highlights How Data Are Produced And Used Within The Silver Industry

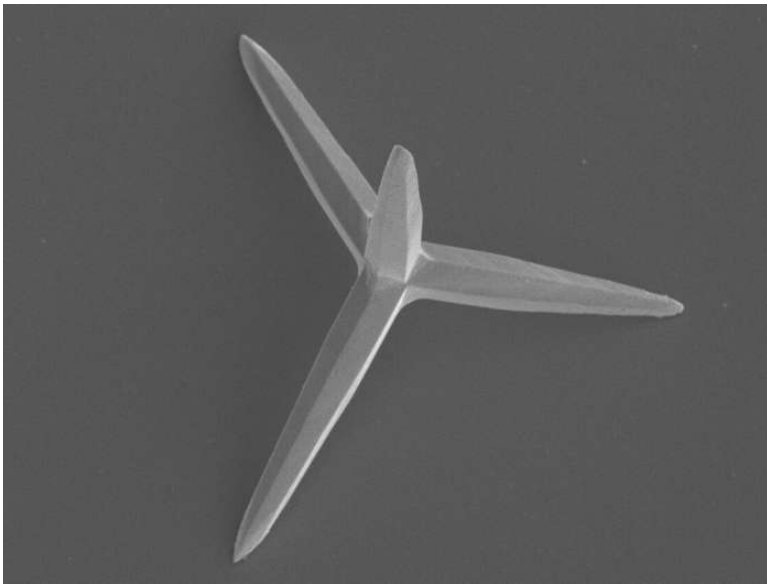
Philip Newman, the managing director of consultancy Metals Focus, is the guest on the latest podcast edition of ***Talking Silver*** from the Silver Institute.

Newman discussed how Metals Focus gathers data worldwide not only from public domain sources but from its network of information gatherers around the globe who have nurtured sources inside the industry who can supply data not readily available to the general public.

He also highlighted how the current silver demand and deficit shows no sign of abating in the near future. "For the industrial demand as a whole we have about an 11 percent rise last year but for PV (photovoltaics) it was up about 64 percent, a dramatic performance." He noted that much of this fabrication is occurring in China. Newman added that consumer electronic demand was slightly down, "which makes the industrial demand even more impressive."

Silver Ions Kill Bacteria on Command

When antibiotics are administered to patients through the bloodstream, the drug not only meets the infection but is dispersed throughout the body even to places where it's not necessary. What if antibiotics could be aimed where they're needed most? Some medical researchers at the Institute of Chemical Research of Catalonia, an autonomous community of Spain, have developed 'micromotors' that can swim through a patient releasing silver ions on cue. The microscopic crystal micromotors contain silver phosphates and are shaped like tetrapods, a structure with four arms, each one about 5 microns long. The micromotors are allowed to roam about the body and are hit by light when the silver particles are to be released. Not only are silver ions released but also oxygen and free radicals, both of which are helpful in killing microbes. After they've done their work, the crystals can be filtered out. In a prepared statement, group leader Katherine Villa, PhD., said: "This work is important because we report a synergistic effect that includes the self-propulsion capability of the micromotors under light stimuli, allowing greater diffusion and dispersion of silver ions as well as released free radicals." She added: "The micromotors are twice as efficient compared to silver nanoparticles alone, according to the results obtained in the study."



ICIQ

Micromotors containing silver ions move through the body and can be activated by light.

Silver Shields Sensitive Medical, Military Gear from Interference

Silver helps to keep electrical interference from medical equipment from disrupting the operation of nearby medical gear.

Electronic devices, especially those used in medical applications, often emit unwanted electrical signals that interfere with other nearby medical equipment. This interference can produce incorrect readings on diagnostic gear such as heart monitors and electroencephalograms (EEG), devices that measure brain waves.

Traditionally, metal sheets or cages have been used to house these offending devices but metal has its drawbacks such as weight, cost and corrosion in hostile environments. Polymers overcome these issues, but they don't stop radio waves from reaching equipment you want to protect – until now.

A consortium of engineers from several research centers including those in China, Oman, Qatar and Pakistan found that a composite of graphene and nanosilver produced shielding from a large portion of interfering signals.

Reporting on their work in the journal Materials, Chemistry and Physics, the engineers noted that the "nanocomposite film exhibits excellent EMI (electromagnetic interference) shielding in the frequency range of 100 Hz to 5 MHz, making it ideal for medical and military applications. In healthcare, the nanocomposite film can shield MRI (magnetic resonance imaging) machines from EMI, ensuring precise diagnostics. In the military sector, shielding is essential for reliable communication and navigation equipment, especially against electronic warfare. As the nanocomposite film is lightweight and thin, it integrates easily into devices and vehicles, enhancing functionality and safety without hindering mobility. The nanocomposite film is thus crucial in safeguarding sensitive electronics in both sectors."

Silver Helps Find Diseases Detected in Sweat

UCSD

This wearable built by the University of California San Diego can detect alcohol in sweat.

Certain chemicals, like those found in sweat, can indicate diseases, such as diabetes, but they're difficult to detect on a wearable because of low levels of perspiration. However, a mixture of silver nanowires and aerogel – one of the world's lightest solid materials – can detect minute amounts of these disease-indicating chemicals, according to scientists at the School of Biomedical Engineering, at Wenzhou Medical University in Wenzhou, China. Aerogels are created by mixing a polymer and solvent to form a gel. Liquid from the gel is then removed and replaced by air. What remains is a low density, very porous material that absorbs a large amount (relatively speaking) of sweat. Silver nanowires are imbedded in the aerogel which allows the aerogel to conduct electricity because the nanowires are highly conductive. This allows even small amounts of electricity to flow and be detected, thus giving a reading on the amount of uric acid and its salts, which are indicative of some diseases. In summing up their work, the scientists said: "The personalized wearable sweat sensor has a great potential to provide the effective evidence for noninvasive UA control in future."

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