

Silver News

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A 'Drinkable Book' Brings Fresh Water to Those in Need Each Silver-Imbedded Page Becomes a Water Filter



Click on the image to see the Drinkable Book in action.

“A lot of water issues aren’t just because people don’t have the right technology, but also because they aren’t informed why they need to treat water to begin with.”

A researcher at the University of Virginia has developed a *Drinkable Book* in which each page acts as a filter producing potable water. The pages are imbedded with bacteria-killing silver nanoparticles and are designed to address life-threatening bacteria and other waterborne diseases for those who live in areas where clean drinking water is not available.

The sheets are bound into a book and users tear them out individually (each page has two filters), and place them in a plastic box – which comes with and houses the book – and pour water over it, much like filling a coffee filter with water. What drips out at the bottom is clean, drinkable water. Each 24-page book can sustain a person for up to four years, according to Water is Life, a group that helps to bring clean water to those who need it.

According to the World Health Organization, about 3.4 million people die each year from waterborne illnesses and many of these people don’t know that their water is unsafe to drink or don’t know how to keep their water free from disease. To mitigate this lack of education, each page also offers tips and ideas, in language keyed to the area, for keeping water free of harmful toxins. Some examples include keeping sewage away from areas where people obtain water, and separating garbage dumps from streams and rivers. “A lot of water issues aren’t just because people don’t have the right technology, but also because they aren’t informed why they need to treat water to begin with,” says Theresa Dankovich, post-doctoral fellow in chemistry at the University of Virginia, who developed the filter paper. “So I really like the educational component, and it’s very nice to store it in a book.”

The paper is produced by soaking each sheet in a bath of silver nitrate and a chemical reduction agent that leaches out the silver ions. The paper is drained and heated to 200 degrees F for several minutes. The silver ions remain in the paper as it is rinsed and dried, turning the pages a rust-orange color.

The pages are then bound with covers and placed in plastic holders that serve as part of the filtering mechanism. The page/filters are perforated to make removal easy. Each page costs about 10 cents and the books cost a few dollars to produce.

The books have been field tested in South Africa and about 20 to 30 books will be tested in Ghana in August under the auspices of Water is Life (www.waterislife.com). The project received support from Carnegie Mellon University and ad agency DDB, which is giving Water is Life free design and advertising services. Dankovich hopes that the books will be mass produced in 2015.

New Provider of London Silver Fix to be Selected

The London Silver Market Fixing Company in May announced that it will discontinue administering the London silver fix on August 14, 2014. (For background on the silver fix, see the [April 2013 edition of Silver News](#).)

The London Bullion Market Association (LBMA) began a process to find a market-based replacement to the silver fix and conducted a market consultation shortly after the cessation announcement. This exercise resulted in a Silver Price Consultation Seminar on June 20 during which seven organizations made presentations to the LBMA.

These organizations included:

- Autilla Ltd/Cinnober Financial Technology of Sweden
- Bloomberg
- CME Group/Thomson Reuters
- ETF Securities
- Intercontinental Exchange
- London Metal Exchange
- Platts

The LBMA is consulting with its membership about which proposal they prefer. In a statement, LBMA officials said, "It is expected that a market consensus will be announced in early July after consultation with regulators. The solution provider will then develop the daily silver price mechanism with the assistance of the LBMA."

The Silver Institute has been in regular consultation with the LBMA and market participants since the process began.

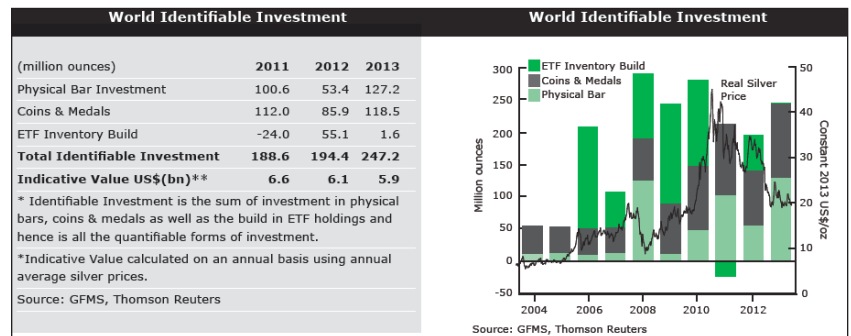
Total Physical Silver Demand Reached Record Level in 2013

Bars and Coin Sales Reach New Highs: World Silver Survey 2014

Silver demand rose by 13 percent in 2013 to an all-time high of 1,081 million ounces, primarily due to a 76 percent increase in retail investment in bars and coins combined with recovery in jewelry and silver fabrication, according to the *World Silver Survey 2014*, published by the Silver Institute in May.

Demand for bullion bars more than doubled last year to reach a high of 127.2 million ounces, while purchases of silver coins and medals rose 38 percent to a record 118.5 million ounces. Investment demand, which includes physical bar investment, coins and exchange traded funds (ETF) inventories, rose by 27 percent to a three-year high at 247.2 million ounces last year.

Industrial applications were 54 percent of total physical silver demand, 586.6 million ounces, dipping less than 1 percent from 2012. Asia, however, experienced a 3 percent increase in industrial silver demand because of gains in the electrical and electronic sector, as well as increases in the ethylene oxide (EO) industry. Japan also had gains in silver industrial demand, bringing total Asian offtake to a new high.



A 10 percent increase in jewelry fabrication was a reflection of improved global economic conditions. Silverware fabrication rose 12 percent to a three-year high due to gains in India and China. Silver-based photography posted a 7 percent decline although it was the slowest percentage decline in nine years.

Other highlights of the *World Silver Survey 2014* include:

- Silver prices averaged \$23.79 in 2013, the third highest nominal annual average price on record, but down 24% from the previous year.
- Mexico led the world in silver production followed by Peru, China, Australia and Russia.
- Above-ground stocks dropped 23.2 percent to 199.7 million ounces. Scrap experienced the largest year-on-year reduction since the 1980s, due to a combination of softer silver prices and an exhaustion of "distressed" coin and jewelry recycling.

World Silver Survey 2014 was sponsored by 22 companies and organizations from North and South America, Europe and Asia that are involved in the global silver industry. The 2014 edition of the *World Silver Survey* was independently researched and compiled by the GFMS team at Thomson Reuters. The Silver Institute has published this annual report on the global silver market since 1990.

Silver, Other Natural Elements Tested in Bone Implants

Goal is to Prevent Antibiotic Resistant Hospital Infections

Hospital-borne infections are a threat to every patient, because the microbes are increasingly resistant to antibiotics. To help combat these dangerous microbes, especially life threatening ones like Methicillin-resistant Staphylococcus aureus (MRSA), a staph infection found in hospitals, health care professionals are turning to silver imbedded in instruments, hip and back implants, fabrics and furniture. Silver kills many bacteria without allowing them to become resistant to its cell-busting properties.

Now, a team of German and French researchers have developed bone implants designed to keep surgical patients free from bacteria. The work being done at the Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB in Stuttgart, Germany, in conjunction with materials scientists at the French CIRIMAT Carnot Institute in Toulouse, has produced a bacteria resistant bone substitute using silver, copper and zinc ions.

Bones mostly are comprised of the protein collagen, formed into a flexible framework, and include the chemical elements calcium and phosphorous, which help strengthen that framework. Instead of adding antibacterial drugs as many implant makers do, the joint team decided to take a different route by taking calcium phosphate crystals and adding natural elements that suppress bacteria.

In the laboratory, researchers were able to infuse silver, copper and zinc ions into the crystals. They infected samples then allowed them to grow. They found that the ion-infused crystals showed a 90 percent drop in several Staphylococcus species, which are among the most common hospital germs. The group also tested peptide coatings and certain enzymes that also yielded good results in killing germs.

The researchers have taken the next logical step in their work by adding human cultures to the implant samples to see if there is any harm to human cells. If these experiments are successful, the German-French teams will conduct clinical trials with patients.

Two Silver-Based, Cyanide-Free Finishes From Dow

[Dow Electronic Materials](#), a unit of The Dow Chemical Company, has introduced two new products in their silver-based Silveron line of surface coatings which the company says offer greater efficiencies, less waste and sustainability. These products are an alternative to finishes that use cyanide, nickel and lead.

Silveron GT-101 is a cyanide-free silver surface finishing solution for electronic products such as contacts on components and printed circuit boards. Company officials say that Silveron GT-101 not only meets growing interest and regulatory requirements of a cyanide-free electrolyte but also delivers stable and predictable results over a wide operating range.

The second product, Silveron GT-820, is a cyanide-free, silver tin electrolyte that the company claims offers outstanding brightness, adhesion, contact resistance and solderability. It can be applied to both copper and nickel alloys.

“The solutions that reduce environmental impact are a testimony to the value we place on sustainable practices,” said J.R. Chen, Global Business Director for Dow Electronic Materials, in a prepared statement. “We will continue to innovate with customers to advance the metallization industry in a more sustainable manner to protect people and our planet.”

The products were introduced at the O&S International Trade Fair for Surface Treatments and Coatings this month.

Silver Inks and Pastes Market to Hit \$5.7 Billion in 2019

The market for silver inks and pastes will be worth \$5.7 billion in 2019 with much of the industry’s growth coming from traditional thick-film technology, according to a report from analyst firm NanoMarkets, based in Glen Allen, Virginia. The thick-film segment consists of membrane switches, keyboards/keypads, capacitors, resistive heaters and electroluminescent wire (EL) lighting. This sector is expected to consume \$2.8 billion in silver inks and pastes in 2019, compared with \$2.0 billion today.

Other markets studied by the report include photovoltaics, displays, OLED (organic light-emitting diode) lighting, RFIDs and sensors.

The report, *Silver Inks and Pastes Markets 2014-2021*, noted that DuPont (U.S.), Henkel and Heraeus (Germany) will continue to dominate the silver inks and pastes market, but the report warns that China is increasingly producing serious competitors in this space, offering high-quality products.

The report suggests that newer market segments will offer opportunities to the silver ink and pastes market but these product areas are not yet known. “For example,” the report noted, “spurred by the growth in the Internet-of-Things and wearable computing, RFIDs and sensors will consume \$115 million by 2019. However, the products and markets in this area are still being defined.”

[Details of the report are available here.](#)

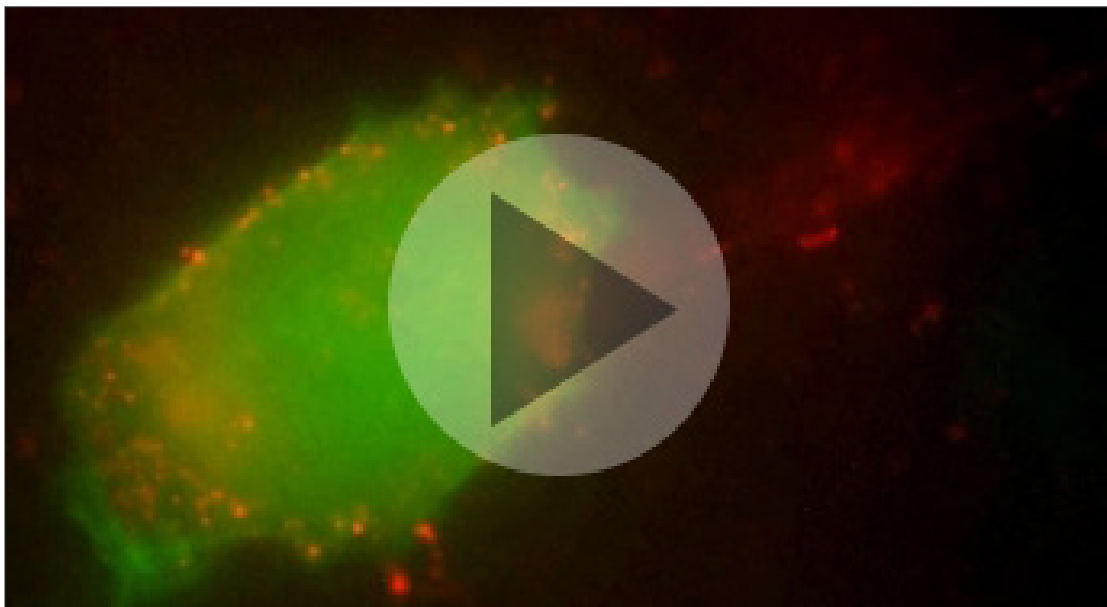
Silver Particles Carry Drugs to Tumors

Piggybacking drugs on silver particles that pierce tumor cells and offload the chemicals is not a new idea, but a uniquely designed nanoparticle offers improvements over current techniques, according to researchers at the University of California at Santa Barbara.

For instance, if the drug/nanoparticle bullet does not reach the intended tumor, an etching technique on the nanoparticle will disassemble if it stays outside living cell walls. The method leaves behind only the intact nanoparticles and the drug which now has been broken down and made inert by biocompatible chemicals contained on the bullet. Doctors can then ‘see’ the nanoparticles through imaging techniques using fluorescent dyes and discover if they have reached their target or not.

This method for removing nanoparticles unable to penetrate target cells is unique, said Gary Braun, a postdoctoral associate in the Ruoslahti Lab in the Department of Molecular, Cellular and Developmental Biology (MCDB) and at Sanford-Burnham Medical Research Institute. “By focusing on the nanoparticles that actually got into cells, we can then understand which cells were targeted and study the tissue transport pathways in more detail. It also minimizes the off-target toxicity by breaking down the excess nanoparticles so they can then be cleared through the kidneys.”

“These new nanoparticles have some remarkable properties that have already proven useful as a tool in our work that relates to targeted drug delivery into tumors,” said Lab Director Erkki Ruoslahti, adjunct distinguished professor in UCSB’s Center for Nanomedicine and MCDB department and at Sanford-Burnham. “They also have potential applications in combating infections. Dangerous infections caused by bacteria that are resistant to all antibiotics are getting more common, and new approaches to deal with this problem are desperately needed. Silver is a locally-used antibacterial agent and our targeting technology may make it possible to use silver nanoparticles in treating infections anywhere in the body.”



UC SANTA BARBARA

Peptide-coated silver nanoparticles moving toward and being ‘eaten’ by a prostate cancer cell (green). Click on image to watch the video.

Australian Scientists Studying Silver-Semiconductor for its Germ-Killing Powers

Instead of using silver metal in antibacterial fabric, a researcher at Melbourne's RMIT University has been testing a relatively new material called silver TCNQ, which releases silver more slowly. It is hoped that this slow rate of release will produce a very long-term, germ-killing effect. TCNQ is a semiconductor (part organic material and part metal) which is used in electronic components, and its antibacterial properties have not been fully studied.

Associate Professor Vipul Bansal, of the School of Applied Sciences, claims that Silver TCNQ (also known as Ag-tetracyanoquinodimethane) may have superior antibacterial properties compared to silver ions when produced in nanowire form. His research, which was reported in the journal *Advanced Functional Materials*, noted: "... it is discovered that these AgTCNQ nanowires show outstanding antibacterial performance against both Gram negative and Gram positive bacteria, which outperforms that of pristine Ag." Bansal also suggested that the antimicrobial action of silver-based materials may not only be due to silver's microbe killing properties but that the nanosize of the particles may also offer a germicidal effect. His team is studying this aspect further.

"There is potential for special bedding, linens and surgical aprons on which bugs and bacteria do not grow, so we can maintain an infection-free environment in our healthcare settings," said Bansal. "We may also have dressings and Band-Aids that can kill bacteria in the wound, resulting in faster healing. These will all have a major impact on the cost of the Australian healthcare system."

The research was done in conjunction with CSIRO, the Commonwealth Scientific and Industrial Research Organisation, Australia's national science agency.

Upcoming Events

13th Annual CISC to be Held in Tianjin, China

The 13th China International Silver Conference (CISC) will be held in Tianjin, China, September 24-26, 2014.

The theme for this year's conference is *Investment in China*, and topics will include:

- The Future Investment Value of Silver
- An Outlook of Silver's Industrial Uses
- Silver's Role in the Antibacterial Industry
- The Outlook of Silver in the Ethylene Oxide/Petrochemical Industry
- How will the Global Economic Recovery Affect the Silver Industry?
- An Analysis of the Chinese Silver Powder Industry
- How China Factors into the Global Commodities Market
- Global Silver Jewelry Market Analysis
- Precious Metals Trading Patterns
- Non Industrial Uses of Silver: How are they Affecting the Industrial Silver Market?

The CISC is hosted by the China Chamber of Commerce of Metals, Minerals & Chemicals Importers & Exporters, the China Nonferrous Metals Industry Association, the China General Chamber of Commerce, the Gems & Jewelry Trade Association of China, and the Silver Institute. The Conference is being organized by the Beijing Antaike Information Development Co. A welcome dinner will take place on September 24, and the speakers' program will cover a full day on the 25th and a half-day on the 26th.

For registration and information go to the [CISC website](#).

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