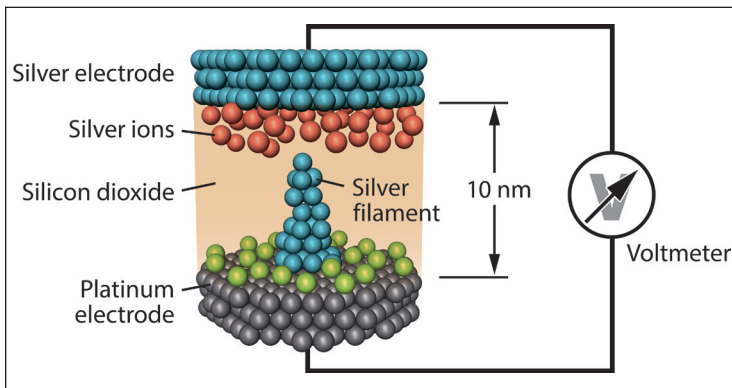


# Silver News

- Silver-Based Memory Devices May Replace Flash Drives
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## Silver-Based Memory Devices May Replace Flash Drives



JÜLICH AACHEN RESEARCH ALLIANCE (JARA)

In a typical ReRAM, an electric voltage is built up between the two electrodes so that the storage cells can be regarded as tiny batteries. Filaments formed by deposits during operation modify the battery's properties, allowing it to act as a memory device.

*“Although there are different types of ReRAMs, those using silver ions show excellent promise, according to industry officials.”*

You may not have heard the acronym ReRAM, but you will soon.

Resistive Random Access Memory or ReRAMs (sometimes written as RRAMs) operate like tiny battery cells and store data through changes in the electrical resistance of the cell. The presence or absence of an electrical charge can be used to store bits of information. Although there are different types of ReRAMs, those using silver ions show excellent promise, according to industry officials.

This burgeoning technology for storing information will eventually replace flash memory – used in thumb drives and many notebooks. Currently, all tablets and smartphones use flash memory, but that too will change in coming years as ReRAMs take their place.

ReRAMs hold advantages over conventional flash drives. Because ReRAMs use so little power – in the nanowatt range compared to hundreds of milliwatts for flash drives – they could allow your smartphone to operate up to a week without recharging. A ReRAM chip the size of a postage stamp can hold a terabyte of data, enough to store 250 high-definition movies. Information is written to ReRAMs faster, nanoseconds compared to milliseconds for flash drives. ReRAMs also last longer; they are able to handle millions of rewrites compared to flash drives that fail after about 10,000 rewrites.

One company, [Crossbar Inc.](#), based in Santa Clara, California, touts its silver-ion based technology for its memory devices, which CEO George Minassian expects to be commercially available next year. Their ReRAM version relies on the formation of a filament produced by the movement of silver ions within a silicon base.

“Non-volatile memory is ubiquitous today as the storage technology at the heart of the over a trillion dollar electronics

*continued on page 2*

market – from tablets and USB sticks to enterprise storage systems,” said Minassian in a prepared statement. “And yet, today’s non-volatile memory technologies are running out of steam, hitting significant barriers as they scale to smaller manufacturing processes. With our working Crossbar array, we have achieved all the major technical milestones that prove our ReRAM technology is easy to manufacture and ready for commercialization. It’s a watershed moment for the non-volatile memory industry.”

Other companies including Toshiba, Panasonic, HP, Micron and Samsung are also working on their own versions of ReRAMs, with many of their designs based on silver ions, too.

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## Silver Added to Hydrogel Bandages Antibacterial Properties Plus Better Wound Treatment

Hydrogel bandages work well for wounds like ulcers and burns that need to remain moist during healing. These bandages also provide a cooling effect, a comfort to patients. Now, New York City-based [Alliqua, Inc.](#) has added silver’s antibacterial power to a new line of hydrogel bandages.

SilverSeal is a flexible, antibacterial hydrogel dressing that is about 93 percent water based and becomes activated when placed on the wound, according to company officials. The dressings come in two sizes, 2”x3” and 4”x5,” and do not bond to the wound because of their moistness. This allows the bandage to be changed without causing pain or pulling off fresh skin. Company officials note that SilverSeal can absorb 2-½ times its weight in wound fluid in contrast to most hydrogel bandages, which are less absorbent.

A bandage can be worn up to seven days during which time silver ions are released at the wound site. In vitro studies have shown that the silver-imbedded fiber in SilverSeal is effective in resisting the growth of bacteria, including methicillin-resistant *Staphylococcus aureus* (MRSA) and *vancomycin-resistant enterococci* (VRE), according to the company.

# College Doors Coated With Silver

## Could Lead to Industry-Wide Logo Promoting Silver’s Antibacterial Power

Doors in four buildings at [Penn State Erie](#) have been coated with silver ions to help keep students healthy, according to school officials, and the project may lead to an industry-wide logo touting the antibacterial benefits of silver coatings.

“It does seem to be effective,” said Beth Potter, assistant professor of microbiology. Potter’s students swabbed 50 door handles on campus and measured bacteria on surfaces with and without the silver treatment. The door handles treated with [Agion](#) silver were consistently cleaner, she reports.

School officials and representatives from [Advanced Finishing USA](#), the company that sprayed the silver ion solution onto the handles, are considering other targets such as water bottles, bus strap handles, gas pumps and emergency exit door bars.

The school’s marketing department got involved in the project, too. Students of marketing professor Mary Beth Pinto used the coating to answer the question: How do you market an invisible product? Early tests on a stair railing at the college used a white coating, and the students found that people were reluctant to touch it, thinking it was wet paint. Tests in which they employed a clear coating to door handles at two local convenience stores showed that customers had no hesitation about touching it, but this presented a new issue: How do you let users know that they just received a benefit from the silver ion coating? This led students to develop signs and logos explaining the value of Agion products.

“Ideally, we’ll get to some kind of identifiable symbol,” said Greg Yahn, president of Advanced Finishing USA. “Something like the Nike swoosh, where you know from 10 feet away: ‘That’s antimicrobial. It’s OK to touch it.’”



PENN STATE BEHREND

Beth Potter, assistant professor of microbiology, center, helps students Holly Pier and Marcelo Lob test for bacteria on a door handle at Penn State Erie, The Behrend College.

# Ask the Silver Institute: Are There Different Kinds of Silver?

Yes. Different purities of silver are used for various applications. For example, *pure silver* often is marked as ‘fine’ or ‘999’ and is 99.9 percent silver. It is generally used for bullion coins and silver plating. When jewelry is plated with silver the process is called ‘flashing.’

Another category is *sterling silver*, an alloy containing 92.5 percent silver and 7.5 percent copper. Sterling silver is traditionally used for jewelry and silverware, and the copper adds hardness to the pure silver which, by itself, is soft and easily scratched. In the United States, any article marketed as ‘silver’ must contain at least 90 percent and is often stamped ‘900.’

For applications where tarnish resistance is desired, germanium replaces some of the copper to produce *Argentium Silver*, which is patented and trademarked by [Argentium International, Ltd.](#) in the United Kingdom. By adding germanium and other substances, the silver produces less fire scale - red or purple stains that appear on sterling silver - during the soldering process. This makes it ideal for artisan silversmiths working on intricate items. Argentium products bear a “flying unicorn” logo and contain between 93.5 percent and 96 percent silver, a higher amount than sterling.

*Britannia silver* contains 95.8 percent silver with the balance usually copper. It is marked ‘958’ and is used mainly to produce tableware. Silver coins known as Britannia, issued by the U.K.’s [Royal Mint](#) since 1998, are minted in 95.8 percent silver.

A common alloy used in jewelry is *9 white carat gold* which contains 62.5 percent silver and 37.5 percent gold.

One additional alloy worth noting is *Nickel Silver*. Despite the name, it contains no silver. Also known as *German Silver* and *New Silver*, the alloy is composed of 60 percent copper, 20 percent nickel and 20 percent zinc.



Silver products are usually marked with their purity.

# Silver Ions Deposited on Glass by High-Speed Spinning

South Korean scientists have discovered a new way to coat glass with a layer of silver ions to prevent the growth of bacteria. This glass can be especially useful for medical apparatus, food service and other applications in which glass equipment must be kept sanitary despite germ-filled environments.

The team at [Yonsei University in Seoul](#) spin-coats the glass with ‘sol-gel,’ a gelatinous solution holding silver ions in the form of silver nitrate. The gel is spun at 2,000 revolutions per minute in a temperature of 392 degrees F. and deposited on the glass with great force. The result is glass with a silver ion coating that is more than 90 percent transparent compared to uncoated glass. In addition, tests showed that the coated glass is slightly more resistant to bending pressure than regular glass. Further testing showed that the glass exhibited all of the antibacterial properties expected of silver ions.

The researchers plan to try their spin-coating technique on other substances such as metals and plastics which would benefit from an antibacterial layer of silver ions.

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# Chinese Researchers Discover New Ways to Enhance Silver’s Germ Killing Power

Scientists from the [University of Science and Technology of China](#) are studying a unique method to increase the antibacterial powers of silver. This research is another instance of the growing trend of taking the germ-fighting properties of silver to a higher level. (See [Silver Gives New Life to Overprescribed and Ineffective Antibiotics](#) *Silver News*, June, 2013.)

The researchers have discovered that hybrid silver/gold nanoparticles, when placed on a sheet composed of graphene oxide, have a greater ability to kill E. coli bacteria than the silver alone. They are not sure why this occurs, but scientists speculate in the journal [Nanotechnology](#) that it could be a result of how the silver/gold nanoparticles align themselves into a two-dimensional structure on the graphene oxide template. This silver/gold structure appears to stick to bacteria more tightly than silver particles by themselves which then proceed to breach the bacteria wall and destroy the cell.

Research is still in its early stages. Next, the scientists plan to study different sizes and shapes of the silver/gold hybrid to see which configuration is most effective against germs. They will also test these hybrid nanoparticles against different bacteria.

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# Upcoming Events

## 2013 Silver Industrial Conference in Washington, D.C.

The [Silver Institute](#) will host the [2013 Silver Industrial Conference](#) in October.

A roster of notable industry leaders will address delegates at the Silver Institute's 2013 Silver Industrial Conference on October 22-23 in Washington, D.C. The event is dedicated to the metal's ever-growing role in the industrial world and will focus attention on future commercial and industrial developments of silver and the changing demands of the silver marketplace.

The program for the conference will provide attendees with important insight into the largest sector of silver demand. An excellent program of high quality speakers has been organized, and the confirmed speakers and their topics include:

- "Silver: The Indispensable Metal – Why Silver is so Prized by Industry" - Ross Norman, Sharp Pixley
- "Silver Electronics – Developing a Mature Market" - Howard Imhof, Metalor Technologies
- "Does Silver Have a Bright Future in Solar Energy Generation?" - Gary Hemphill, Technic
- "The View from Europe: Opportunities in the Industrial Market" - Arnd Gollan, Allgemeine Gold-und Silberscheideanstalt AG
- "The Outlook for Ethylene Oxide Demand" - Doug Rightler, PCI Global
- "Biocidal Properties of Silver – Market Potential and Utilization" – Heather McGinley, Dow Microbial Control
- "Supply Side Management in the Americas – Servicing the World's Largest Fabricator" - James Steel, HSBC
- "From E-Scrap to Electronics: Can Recycling Help Support the Industrial Market?" - Chip Milligan, Rochester Silver Works
- Panel Discussion on "The Way Forward for Industrial Demand: Identifying Opportunities on the Horizon." Participants include Conor Dullaghan of OPM Metals, Grant Angwin of Johnson Matthey, Andy London of the Heraeus Photovoltaics Business Unit and Michael O'Neill of Materion Microelectronics & Services.

The conference will be held at the Capital Hilton Hotel, in downtown Washington, D.C. It will start with networking opportunities at an opening reception on the evening of October 22 and the formal conference program will be all day on October 23.

Registered attendees include executives and experts from across the silver supply chain representing industrial fabricators, mining companies, refiners, bullion banks and trading companies.

To take advantage of the opportunities that will be available at this conference, your early registration is encouraged.

[Register for the conference here.](#)

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Larry Kahaner  
Editor

[www.silverinstitute.org](http://www.silverinstitute.org)  
@SilverInstitute on Twitter

THE  
SILVERINSTITUTE

1400 Eye Street, NW, Suite 550  
Washington, DC 20005  
T 202.835 0185  
F 202.835 0155