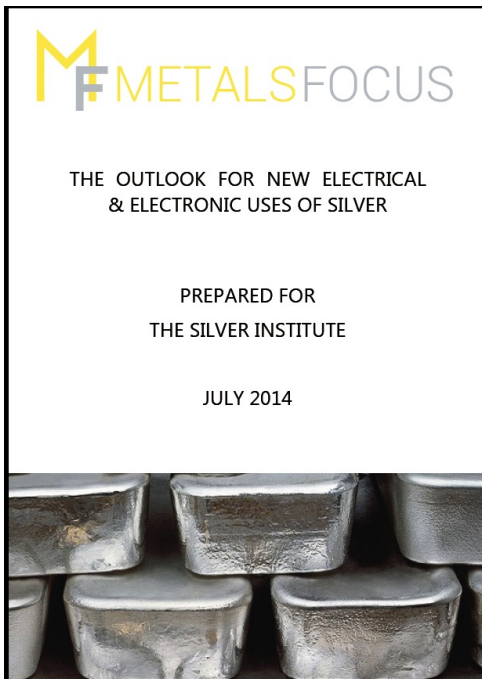


# Silver News

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## Silver Industrial Demand Expected to Outpace Global GDP Growth Through 2016: Silver Institute Report



From *The Outlook for New Electrical & Electronic Uses of Silver Report* (page 11): "Familiar end-products, namely displays, lighting and semiconductors are given a new lease of life through technological developments, with silver playing a pivotal role in enabling and accelerating the development of new variants."

Three possible growth areas for silver demand -- flexible electronics, light emitting diodes (LEDs) and interposers (connectors used in building integrated circuit chips) -- have the potential to add another 20 million ounces of silver to total demand by 2018, according to *The Outlook for New Electrical and Electronic Uses of Silver*, a report issued on July 31 by the Silver Institute.

Highlights of the report, produced by London-based consultancy [Metals Focus](#), include:

- Silver industrial demand, which accounts for over 50 percent of global demand, is expected to grow 5 percent per year from 2014-2016, outpacing forecasted global GDP growth.
- Within the electronics sector, the report forecasts notable gains in silver use for flexible displays which are found in tablets, cell phones and e-readers.
- The report indicates a healthy rise in LED demand, driven by falling costs and increasingly stringent lighting energy legislation that will accelerate LED adoption, thus leading to strong demand for silver.
- Interposers that include silver could hold considerable promise for future silver demand. Interposers enable far greater functionality in the next generation of semiconductor chips. Given the greater technical demands made of interposers, glass -- with the addition of silver -- is being considered as an alternative material to silicon. The report notes that if glass with silver prevails as the interposer of choice this will increase silver demand.
- The outlook for established end-uses, such as silver's use in ethylene oxide (EO) production, which is a key building block chemical in the production of detergents, solvents and plastics also shows growth potential. Silver demand in the EO sector has enjoyed near uninterrupted growth over the past 30-40 years, primarily due to growing usage in consumer and industrial products. The EO category could see even greater silver demand, especially in the United States, with the advent of shale gas potentially resulting in new EO plants.
- Photovoltaics for solar power installations may well surpass its previous demand peak, registered in 2011, as early as 2016-17.

The report can be downloaded free at:

[The Outlook for New Electrical & Electronic Uses of Silver Report](#)

# The State of Silver and 3-D Printing

By Jeffrey Ellis,  
Senior Technology Consultant to The Silver Institute

3-D printing — a process of making a three-dimensional object by adding successive layers of material under computer control — which can be accomplished using metals, plastics and composites, is now being used in the manufacture of many products in which silver is the main or a key component. These products range from circuit boards to jewelry to prosthetic devices.

Two types of 3-D printing processes involve silver. One is the equivalent of casting silver into a 3-D printed mold such as those made of plaster-fortified wax. Casting silver in a preprinted mold is almost exactly the same as standard casting of silver. A wax or polymeric mold is made and treated with plaster. Silver is then poured into the plaster-lined mold. After cooling, the plaster mold is removed, leaving the silver object, which usually needs to be polished or sanded to remove rough areas. The main advantage of using 3-D printing to make molds is that it offers a greater range of design capabilities, especially in the manufacture of products incorporating delicate designs such as lacework.

The second type of printing is direct laser sintering, a process of forming a solid with heat that does not reach the melting point. The formation of 3-D printed objects directly with silver is a relatively new technique that has yet to be widely adopted. It is under consideration from designers, silversmiths, and manufacturers of jewelry and silverware. This technique uses high intensity light to fuse the silver and then shape it. The high reflectivity of silver is a serious challenge because so little of the light is absorbed to accomplish the fusing. This technical difficulty is being overcome by reformulating the silver to make it less reflective. This currently is done by Cookson Precious Metals Ltd (UK) and by artisan-developed compositions of silver within a binder. A masking technology and new alloys may also be used.

Although initial use is primarily for jewelry, manufacturing sterling silver tableware and hollowware is being researched. Further use of 3-D printing may also be possible in the production of coins, medals, and other objects by government and private mints. It is also anticipated that 3-D printing with silver can be used in the mass manufacture of batteries and other electrical components ([See 3-D Printers With Nanosilver Can Build Batteries Into Tiny Electronic Products, December, 2013, Silver News](#)).



SHAPEWAYS

Dutch 3-D printing service company [Shapeways](#) prints objects in sterling silver using a casting method.

# Royal Canadian Mint Issues Second in Series of Four Birds of Prey Coins

## First Coin Approaching Sell Out of One Million Units

The Royal Canadian Mint has issued the second coin in its biannual *Canadian Birds of Prey* silver bullion four-coin series. This one-ounce 99.9 percent silver coin features the Bald Eagle and follows the Peregrine Falcon coin issued in February. That coin is approaching a sell-out of its mintage of one million coins, Mint officials noted.

“The Royal Canadian Mint is committed to remaining a leader in the precious metal market by offering investors a continually evolving suite of bullion products crafted with exceptional attention to quality and purity,” Marc Brule, Interim President and CEO of the Royal Canadian Mint, said in a prepared statement. “The Birds of Prey - Bald Eagle 99.99 percent pure silver bullion coin has a theme whose appeal and relevance transcends borders and we expect it will shine a new light on the diversity of our investment products.”

For more information, please visit the [Mint website](#).



RC MINT

The Bald Eagle is the second in a series of one-ounce *Canadian Birds of Prey* silver bullion coins.

# Heating Silver Nanoparticles to Kill Cancer Cells

Killing cancer cells with heat is not a new idea, but researchers at [Dartmouth-Hitchcock Norris Cotton Cancer Center](#) in Lebanon, New Hampshire, are using silver nanoparticles to help minimize damage to adjacent healthy cells during the heating process.

In their experiments, the researchers introduce inactive, metallic nanoparticles containing silver, gold or iron to cancer cells which absorb the microscopic particles. The nanoparticles are then shot with magnetic energy, infrared light, or radio waves. The interaction creates heat that kills cancer cells. In addition, when precisely applied, the heat can also prompt the body's immune system to kill cancer cells that have not been heated. The goal is to kill cancer cells but leave unharmed healthy nearby tissue and cells. The small size of the nanoparticles helps to focus the heat therapy.

“The use of heat to treat cancer was first recorded by ancient Egyptians, but has reemerged with high-tech modern systems as a contributor to the new paradigm of fighting cancer with the patient's own immune system,” said Steve Fiering, PhD, Norris Cotton Cancer Center researcher and professor of Microbiology and Immunology, and of Genetics at the Geisel School of Medicine at Dartmouth.

The Dartmouth-Hitchcock team is also using nanoparticles to deliver anti-cancer drugs with pinpoint accuracy. “Our lab's approach differs from most in that we use nanoparticles to stimulate the immune system to attack tumors and there are a variety of potential ways that can be done,” said Fiering. “Perhaps the most exciting potential of nanoparticles is that although very small, they can combine multiple therapeutic agents. Now that efforts to stimulate anti-tumor immune responses are moving from the lab to the clinic, the potential for nanoparticles to be utilized to improve an immune-based therapy approach is attracting a lot of attention from both scientists and clinicians. Clinical usage does not appear too distant.”

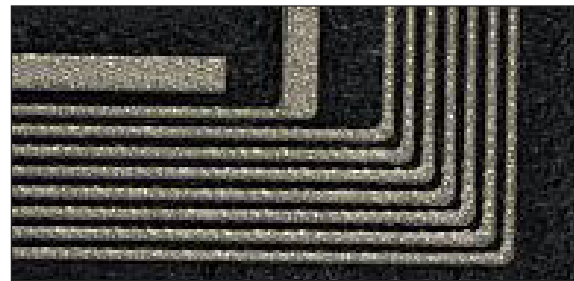
# Silver Paste Only Needs UV Light to Cure

A silver paste that allows printed circuits to be screen printed and cured with ultraviolet light instead of thermal curing has been developed by [Tanaka Holdings](#), a unit of Tanaka Precious Metals, according to company officials.

This technology enables curing at room temperature with ultraviolet light in about 10 seconds compared to thermal curing, which takes several hours. In addition, the company's UV700-SR1J paste allows the creation of 'micro wiring' with a width of 70 micrometers on surface-treated Polyethylene terephthalate (PET) substrates which is narrower than with conventional screen printing. Company officials note that the electrical resistivity of the wiring is 10<sup>-4</sup> ohm-cm (10 to the power of minus 4 ohm per 1 centimeter), a level of electrical conductivity comparable to UV-curable and thermally-curable silver pastes used in conventional flexographic printing.

Some applications of the new paste include solar cells, touch panel displays, organic LED lighting, e-books and RFID (radio-frequency identification) tags. Because heat is not used to cure the silver paste, additional applications of heat-susceptible materials such as polyvinyl chloride (PVC) film are now possible.

In July, Tanaka, a member of The Silver Institute, conducted demonstrations of the new silver paste at the SEMICON West 2014 tradeshow in San Francisco.

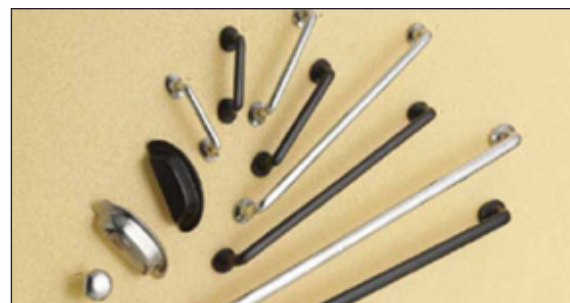


This printed circuit board was produced by subjecting a newly-developed silver paste from Tanaka to ultraviolet light. It does not require thermal curing like traditional pastes.

# Home Hardware Features Antibacterial Silver

[Hafele NZ Ltd.](#), a maker of hardware and accessories for cabinetry, architectural woodworking, closets and sliding doors, featured its silver-based antimicrobial hardware collection and motorized closet systems at the recent International Woodworking Fair in Atlanta, Georgia.

The New Zealand-based company offers the new line of hardware in nickel, matte chrome or stainless steel, all of which feature a clear, silver-ion coating to inhibit the growth of bacteria. “The Antimicrobial collection offers an advanced technology for spaces from homes to hospitals,” said Product Manager for Decorative Hardware Greg Sheets at Hafele America Co. in Archdale, North Carolina.



These hardware items have a clear silver-ion coating for antibacterial protection.



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# Ask the Silver Institute: How is Silver Used as a Catalyst?

A catalyst is a substance that facilitates a chemical process without undergoing change itself. In fact, without catalysts many chemical reactions would proceed so slowly that for all practical purposes, they wouldn't occur at all.

Finely-divided silver when heated with oxygen forms silver oxide. Silver oxide breaks apart into the elements at the ethylene oxide formation temperature of 200 degrees C. The oxygen then reacts with the ethylene and the silver turns back into finely-divided silver. Taking advantage of the chemistry of silver oxide formation and its ability to break apart to produce reactive oxygen has been found to be the best way to make ethylene oxide. The silver remains unchanged and acts as the catalyst in the reaction. Most ethylene oxide, or EO as it's often called, is used to make ethylene glycol which accounts for most of the world's EO consumption. Ethylene glycol, in turn, is used to produce many products including polyester fibers for clothes and carpets, plastics, solvents and other chemicals, and even antifreeze formulations. By itself, EO is used to sterilize many health-care products and medical instruments, including delicate electronic or optical tools, which would be harmed by the high heat or radiation sterilization processes. EO is also used to accelerate the aging of tobacco leaves, as a fungicide, and even as a preservative for spices.

Another catalyst use for silver is to produce formaldehyde, which is the key ingredient in some plastics and synthetic fabrics, and is also used as a major component of plywood, building insulation, and embalming fluid. Watered-down solutions of formaldehyde are used as a disinfectant agent because they kill bacteria and fungi. Small amounts of formaldehyde derivatives are used in cosmetics and other products to keep them germ free.

About 90 percent of silver used as an industrial catalyst is for producing ethylene oxide from ethylene. More than 130 million ounces of silver are currently employed to produce ethylene oxide.

Researchers continually are experimenting with using silver as a catalyst in producing other chemical compounds with the goal of lowering production costs by speeding up processes or allowing chemical reactions to occur with less input of heat or use of extreme environments.

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## Upcoming Events

### 13<sup>th</sup> Annual CISC to be Held in Tianjin China

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

The theme for this year's conference is *Investment in China*, and key topics, among others, 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 Metal, 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 Antaika Information Development Co. A welcome dinner will take place on September 24<sup>th</sup>, and the speakers' program will cover a full day on the 25<sup>th</sup> and a half-day on the 26<sup>th</sup>.

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

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