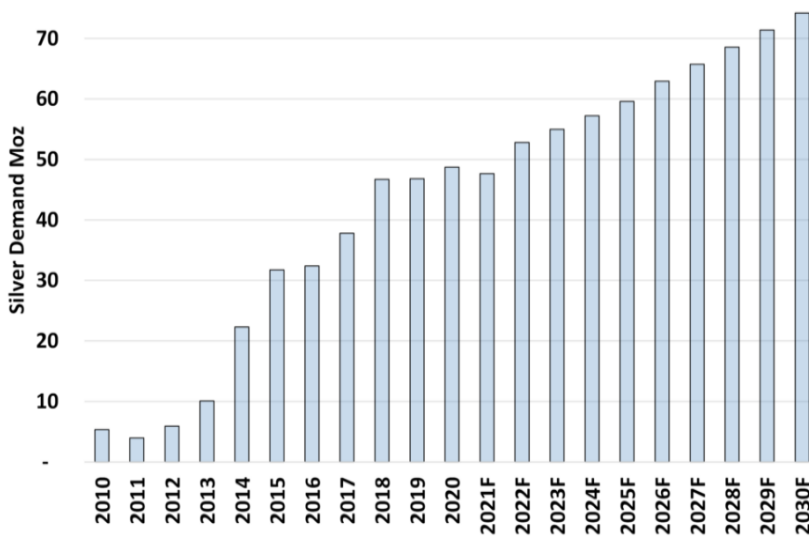


Silver News

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Silver Demand for Printed and Flexible Electronics Expected to Increase 54 Percent Over Next 10 Years



Printed & Flexible Electronics Market Silver Demand.
Source: Precious Metals Commodity Management LLC

“Printed and flexible electronics will consume 615 million ounces of silver over the next 10 years.”

Almost 34% of the global silver supply in 2020 was used in electronic devices. And, while this overall segment is expected to continue to grow, one sector in particular – printed and flexible electronics – is forecast to rise a dramatic 54% from 48 million ounces (Moz) in 2021 to 74 Moz in 2030, consuming 615 million ounces over the 10-year period.

Silver is used in almost every electronic item, such as the ‘wearables’ sector with products that measure heart rate, temperature, respiration, and other bodily conditions through silver-imbedded, flexible, natural and artificial textiles. Silver is also vital in devices such as mobile phones, tablets, computers and automobiles where the metal is used in circuit boards, wiring and in components such as switches and chips, many of which are printed with silver inks.

In addition, with advances in technology, silver is being printed not only on wearables and circuit boards but also on labels and packaging because of the metal’s antibacterial properties that protect users’ health. Silver labels are also a mainstay of warehouse logistical operations through their use in sensors and RFID devices (like those used in retail antitheft tags), according to *Silver in Printed and Flexible Electronics*, a report authored by the precious metals consultancy [Precious Metals Commodity Management](#). The publication is one in a series of *Market Trend Reports* published by the Silver Institute.

Silver is indispensable for electronics applications because it is the world’s most conductive metal. Moreover, it is relatively easy to screen print, dispense by an inkjet, aerosol or roll-to-roll print (like conventional inks). It also offers corrosion resistance, bendability and stretchability without breaking, all while maintaining its electrical conductivity. Silver is ideal for devices such as sensors that require high reflectivity, another outstanding characteristic of the metal.

To download the complimentary report, *Silver in Printed and Flexible Electronics*, please click [here](#).

Silver – A Crucial Element in Measuring Athletic Performance

Silver is a vital part of fabrics used in sports performance-measuring textiles because of the metal's high conductivity and antibacterial properties, according to George Sun, CEO of [Nextiles, Inc.](#) a Brooklyn, New York-based company that partners with sports teams and others to collect and analyze data on body movements.

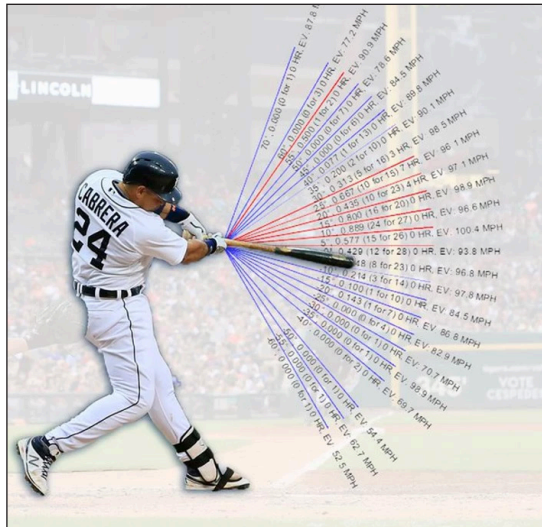
For example, a major league baseball club might want to know how to help a player become a more efficient batter. The athlete would wear a jersey imbedded with sensors that detect every movement and Nextiles personnel would collect and analyze the data. The ball club could then use that information to alter the batter's stance, swing and other movements, including micromovements that are difficult to see with the naked eye.

Silver is ideally suited for use in threads and sensors because of its extremely low resistance to electricity. "If I use one meter of silver thread, what's the resistance or conductance of that one-meter length? Sun told *Silver News*. "... we are measuring decimal points of voltage and current changes."

He added that silver does not interfere with the fabric's properties. "It does not impede the parent material. When we coat it with silver, it still retains the original parent property. It's almost like silver is a passive element, like you're coating it with a different color, but we still retain the physical fabric's properties."

Silver's antibacterial powers and flexibility are added benefits. "Silver has been great because it has flexibility, retains its color, and has antimicrobial properties," said Sun. "Sweat is a mixture of salts and bodily fluids that seep into our clothing. We don't have any concern over smell or bacterial fungal buildup. That has been a very popular feature. We are thankful for the work that has been done thus far about silver, and we're piggybacking off of these features. It's not that we're reinventing it; these features have been acknowledged and embraced by the athletic and consumer community. It's kind of a cherry on top when we use silver."

Nextiles grew out of initiatives at the Massachusetts Institute of Technology and the National Science Foundation.



GREAT LAKES BAT CO.

Silver threads woven into baseball uniforms help coaches analyze a player's swing, leading to more efficient batting stances and movements.

Silver Nanoparticles Strengthen Plants and Crops

A Dutch company is selling trace elements, including silver nanoparticles, to farmers to help them grow better and more hardy crops.

"Nano trace elements strengthen plants, making them stronger, rendering a better structure and producing greater yield per square meter," said Frank Combee, sales manager with [Hortus Supplies International](#), a Netherlands-based company that supplies fertilizers, chemicals, natural products, machines and other plant grower needs. The trace elements are being produced by [B+H Solutions GmbH](#), a German company that sells sustainable agricultural products.

In a prepared statement, Hortus officials noted that nano trace elements are small nutrients that are easily absorbed into the capillaries of plants. This makes the absorption of nutrients such as iron, calcium, copper, and silver very effective. Good absorption of these substances makes plants more resilient.

"Silver strengthens capillaries," said Combee. He added that nano trace elements have been used in vegetable and ornamental cultivation for a long time (Potassium, for example). "In vegetable cultivation, the main reason for working with our nano trace elements is that it gives plants better health. In ornamentals, the main reasons for applying our nano trace elements are better plant growth, more yield, and longer vase life," he added.



Click on the image to see how trace elements produce healthier plants and vegetables.

New Finding: Silver Changes Shape and is Consumed When it Attacks Bacteria

Study Could Lead to Further Understanding of Silver's Antibacterial Powers

A research team from Italy, the United States, and Singapore has just learned something entirely new about how silver reacts with bacteria, and the scientists' work could help us understand further how silver kills germs.

Their studies show that contrary to current thought, silver does indeed change its structure as it destroys the structure of a bacteria cell. The researchers found that during interactions with *E. coli* bacteria, some of the silver nanoparticles dissolved in the environment and spread as ions before making their way into the microbes. As they dissolve, the silver changes shape from triangular to more rounded.

"It seems from this study that silver is 'consumed' from the interaction," said Guglielmo Lanzani, one of the authors on the paper and director of the Center for Nano Science and Technology of IIT-Istituto di Tecnologia, quoted in *Science Daily*. He added that this change does not affect the silver particle's biocidal properties but does affect its optical properties.

The group is planning further experiments to understand why silver works better than other materials against bacteria, and why bacterial membranes are particularly vulnerable to silver, while other cells – like those that make up mammals – remain less affected.

The study, [published](#) in the journal *Chemical Physics Reviews*, notes: "Nevertheless, we reckon that a lack of fundamental physical understanding hampers the prediction of the material behavior upon contamination with bacteria. Therefore, this study illustrates innovative research opportunities in the field of biophysics."

Gold-Silver Catalysts Lose Silver During Chemical Processes and Scientists Want to Know Why

Gold-Silver particles are used for catalysis and electrocatalysis, but at some point during these processes, silver leaches out which changes the particles' ability to continue to act as an effective catalyst.

If we could stabilize and retain more silver particles, it could lead to a finely-tuned 'library' or collection of gold-silver particles of different compositions, which would be available for specific applications without fear of degradation during processes.

Scientists at Rice University and the University of Duisburg-Essen in Germany are working on just such a problem, and the payoff could be a substantial boost for the production of plastics, chemicals and neutralizing environmental pollutants, for example.

Using electron microscopes, and specially-developed techniques, chemists have figured out a way to watch silver exit the gold-silver alloys leaving mostly gold behind. They watched in real time as the silver leached out and actually quantified its amount.

Their study, which appeared in the American Chemical Society journal [ACS Nano](#), noted that silver leaching occurred in two stages. "Usually, silver leaching would last about two hours under our conditions," said Rice University researcher Alexander Al-Zubeidi in a prepared statement. "Then in the second stage, the reaction no longer happens on the surface. Instead, as the gold lattice rearranges, the silver ions have to diffuse through this gold-rich lattice to reach the surface, where they can be oxidized. That slows the reaction rate a lot.

"At some point, the particles [become passive] and no more leaching can happen," he said. "The particles become stable. So far, we've only looked at particles with a silver content of 80%-90%, and we found that a lot of the particles stop leaching silver when they reach a silver content of about 50%... That could be an interesting composition for applications like catalysis and electrocatalysis. We'd like to find a sweet spot around 50%, where the particles are stable but still have a lot of their silver-like properties."

Silver Nanoclusters May Hold Special Power to Stop Cancer Cells from Reproducing

Silver nanoclusters have been shown to halt DNA replication by binding directly to a protein that allows DNA strands to replicate. Without that replication, cells cannot grow thus giving scientists a new way to look at methods to curb deadly cancers in patients.

The [investigation](#) is being conducted by researchers in the Institute for [Cancer Genetics at Columbia University Vagelos College of Physicians and Surgeons](#) and the [Herbert Irving Comprehensive Cancer Center](#).

Interestingly, the scientists found that other silver materials, including silver nanoparticles and silver ions, did not affect DNA replication at all.

Although it is well proven that silver ions can kill bacteria cells, mainly by causing the cell walls to crumble, "it seems there's something inherent in the geometry of the silver nanoclusters that's stopping DNA replication," said Jean Gautier, professor of genetics & development in the Institute for Cancer Genetics and in whose lab the work is being performed. Although the work may shed light on how cancer cells replicate, it also may aid in understanding how DNA molecules, in general, replicate, which could lead to further discoveries in genetic science.

"In the long term, we may be able to harness the toxicity of silver nanoclusters," Gautier said in a prepared statement. "Our study could also serve as a starting point to develop inhibitors of the [protein complex] for both experimental and therapeutic applications."

Domed Coin Containing “Silver Tears” Honors Incan Legend

A coin with a domed central element from the [Perth Mint](#) honors the Inca legend about the moon goddess Mama Quilla, who cried bits of silver upon the earth as she wept.

The [2021 Tears of the Moon](#) coin resembles a souvenir snow globe and the entire coin, including the ‘silver tears,’ contains 2 ounces of .999 silver. It is being issued for the nation of Tuvalu, retails for AUS\$235.45 and is limited to a mintage of 2,500 coins.

The obverse side shows an effigy of Queen Elizabeth II and an Incan cross design known as *chakana*. On the reverse is the clear dome containing silver particles floating in mineral oil. Surrounding the dome is a depiction of Mama Quilla being attacked by a serpent-like beast and a mountain lion. In Incan lore, lunar eclipses occurred because Mama Quilla was being bitten by one of these animals which caused the moon to look like a bite had been taken out of it.

Each coin has an antiqued finish and is housed in plastic case that resembles Mama Quilla’s face.



[Click the image to watch a video of the Tears of the Moon coin.](#)

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