THE SILVERINSTITUTE

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Silver News

Global Industrial Demand on Track for a Record High in 2024

Silver Supply and Demand

Million ounces	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024 E	Year on Year 2023	Year on Year 2024E
Supply													
Mine Production	882	897	900	864	851	837	784	831	839	829	837	-1%	1%
Recycling	160	147	146	147	149	148	164	174	177	179	187	1%	5%
Net Hedging Supply	11	2	0	0	0	14	8	0	0	0	0	na	na
Net Official Sector Sales	1	1	1	1	1	1	1	2	2	2	1	-6%	-9%
Total Supply	**1,054**	**1,047**	**1,047**	**1,012**	**1,001**	**1,001**	**958**	**1,006**	**1,018**	**1,009**	**1,026**	**-1%**	**2%**
Demand													
Industrial	450	457	490	526	524	523	510	561	588	655	702	11%	7%
Photography	41	38	35	32	31	31	27	28	27	27	26	-2%	-4%
Jewelry	193	203	189	196	203	202	151	182	235	203	212	-13%	5%
Silverware	53	58	54	59	67	61	31	41	74	55	58	-25%	5%
Net Physical Investment	283	309	213	156	166	187	208	284	337	243	208	-27%	-16%
Net Hedging Demand	0	0	12	1	7	0	0	4	18	12	3	-31%	-77%
Total Demand	**1,021**	**1,065**	**992**	**971**	**999**	**1,004**	**927**	**1,100**	**1,279**	**1,198**	**1,208**	**-6%**	**1%**
Market Balance	**34**	**-18**	**55**	**41**	**2**	**-4**	**31**	**-93**	**-261**	**-189**	**-182**	**-28%**	**-4%**
Net Investment in ETPs	-0	-17	54	7	-21	83	331	65	-126	-42	100	-67%	na
Market Balance less ETPs	**34**	**-1**	**1**	**34**	**23**	**-87**	**-300**	**-158**	**-135**	**-147**	**-282**	**9%**	**92%**
Silver Price (US$/oz, London price)	19.08	15.68	17.14	17.05	15.71	16.21	20.55	25.14	21.73	23.35		7%	

Source: Metals Focus

Industrial demand is forecast to rise by 7% in 2024 to surpass 700 million ounces for the first time.

Strong industrial demand for silver in 2024 will, for the fourth consecutive year, result in a record physical deficit, which helped to push the price of the metal to nearly $35 (it has since retreated) for the first time since 2012. All totaled, record industrial demand and a recovery in jewelry and silverware will lift global silver demand to 1.21 billion ounces in 2024, while mine supply is forecast to rise by just 1%, according to a presentation by Philip Newman, Managing Director and Sarah Tomlinson, Director of Mine Supply at Metals Focus at the Silver Institute's Annual Silver Industry Dinner in New York in November. Metals Focus researched and produced the 2024 *World Silver Survey*, which was released in April and can be viewed here.

Industrial demand is forecast to rise by 7% in 2024 to surpass 700 million ounces for the first time. This gain is mainly from green economy applications, especially the solar sector. As the automotive sector relies on more sophisticated components, it too will use more silver. Most other silver segments are expected to grow this year, with silver jewelry and silverware both forecasted to rise by 5% in 2024 with India leading demand. Jewelry consumption is also set to grow in the U.S., the presenters said.

Exchange Traded Products (ETPs) are on track for their first annual inflows in three years, as expectations of Fed rate cuts, periods of dollar weakness and falling yields have raised silver's investment appeal. Physical investment (coin and bar demand), is forecast to fall by 15% to a four-year low of 208 million ounces, mainly focused in the U.S. where demand for coins and bars fell 40% reflecting the absence of new crises.

Global mine production is forecast to rise by 1% year over year to 837 million ounces with output from Mexico, Chile and the U.S. higher than Peru, Argentina and China.

For further details click here.

Solar Cells' Efficiency Increased with the Addition of Silver

The mineral kesterite is being studied by researchers for its potential use in solar cells because it is non-toxic, environmentally friendly and naturally abundant. The mineral exhibits good light absorption in solar cells, but thin-film cells using kesterite have only achieved about 15 percent efficiency compared to other cells composed of copper and semiconductors such as Indium and Gallium which have an efficiency over 24 percent. The downside, though, is that these cells are difficult to produce commercially, because they don't scale up without high production costs.

However, scientists in South Korea have discovered that by adding silver to the kesterite-based cells they may be able to increase their efficiency while being commercially viable. Silver doping, they have found, has the ability to allow the solar cell crystals to grow larger and faster without the defects that often accompany crystal growth.

"In this study, we analyzed the effect of silver doping, which had not been clearly identified before, process by process, and found that silver plays a role in suppressing tin loss and improving defects," said Yang Kee-jeong, a senior researcher at the Division of Energy & Environmental Technology, DGIST (Daegu Gyeongbuk Institute of Science and Technology), in a prepared statement.

The team, which included scientists from Incheon National University, also discovered that where the silver was placed affected the performance of the solar cell thus giving further insight into producing more efficient cells. "The results provide important insights into the design of silver-doped precursor structures to improve solar cell efficiency and are expected to contribute to the development of various solar cell technologies," he added.

Choksi Heraeus Meets LBMA Standards for Good Delivery

Having satisfied LBMA requirements, the silver refinery of Choksi Heraeus Pvt. Ltd. (CHPL) in November was added to LBMA's Good Delivery List for silver. Only bars that meet Good Delivery standards are acceptable for the physical settlement of London market silver transactions. Currently 81 silver companies are on the list.

Some of the standards for acceptance to the Good Delivery list include a company's ownership, history, production capability and financial standing. CHPL's silver bars have also passed LBMA's testing procedures which means that the bars were examined and assayed by independent referees, and its own assaying capabilities were tested.

The company was founded by Ravindra Choksi in 1952 in Udaipur, India, to grow industrial uses for platinum and other precious metals in that country. The family-owned business in 1994 began a joint venture with German company Heraeus. Choksi Heraeus "serves the needs of industries in switchgear, automotive, aerospace, electronics, ceramic & glass surface decoration, jewelry and photovoltaic with solutions and products of precious metals and special materials," according to the company's website.

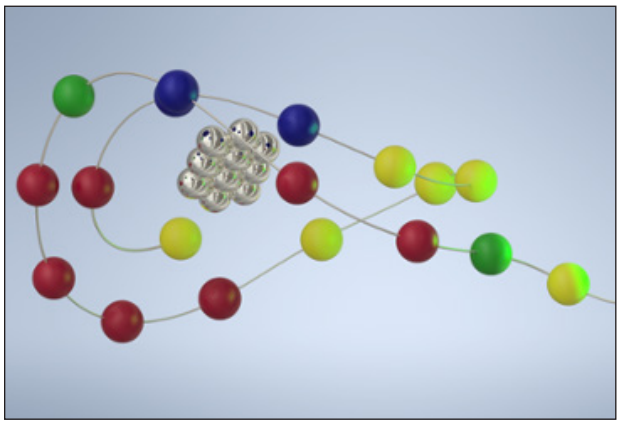
Silver and DNA Team Up to Fight Cancerous Tumors

Physicists at Leiden University in The Netherlands say they have found a novel way to kill cancerous cells using a package of DNA and silver, without harming surrounding cells. This could be a big step forward in cancer treatments as traditional chemotherapy and radiation protocols can harm patients.

The two researchers, Donny de Bruin and Dirk Bouwmeester, wrapped a single DNA strand around silver atoms which enter the body without injuring patients. "This package is so small that it can safely enter body cells without causing any harm. Once it reaches the intended location, we activate the silver with light. It triggers a 'spike' of toxicity. This halts the normal DNA processes in the exposed cell, preventing the cells from multiplying. The body then disposes of the damaged cells," said De Bruin, in a prepared statement.

This procedure is effective and safe, according to researchers at the Netherlands Cancer Institute, and it can be applied anywhere the light can reach using minimally-invasive endoscopy equipment.

"Producing our silver packets costs just a few tens of dollars, and they're ready for use after just one night,' said De Bruin. "Our primary goal is to establish an effective treatment for skin cancer. However, the potential applications extend beyond that; this technique could target all types of solid tumors attached to organs. We are optimistic about making a significant impact on cancer treatment for patients in the future."



LEIDEN UNIVERSITY

Illustration of a DNA strand with silver atoms

Silver Investment Can Diversify and Reduce Portfolio Risks

Institutional Investors Can Benefit from Silver's Multifaceted Uses

Because of silver's role as a relatively safe investment haven – having low correlation with stocks and bonds – and its growing use as an industrial and high technology metal, institutional investors could strengthen their portfolios by investing in silver, according to a recently-published report.

The 27-page report, titled *Silver's Strategic Edge: Navigating the Tectonic Shift in Global Markets,* co-published by The Silver Institute and Toronto-based Capitalight Research Inc., notes that global silver demand is forecast to reach over 1.2 billion ounces in 2024 coupled with a modest increase in supply of 1 percent. This will increase the silver deficit to 265.3 million ounces, further bolstering silver's attraction as an investment vehicle.

In addition, silver has additional benefits in today's sometimes unsettling and often challenging financial environment. "The Covid pandemic and ensuing lockdowns changed the economic and financial landscape for years to come. This, coupled with increased geopolitical tensions, is encouraging greater silver ownership," the report stated. "In March of 2024 the silver price broke out of the range to new multi-year highs on expectations that central banks, notably the Fed, would start reducing interest rates and on increased geopolitical tensions."

Moreover, since March 2020 the price of silver has significantly outperformed many other commodities due to its roles as an inflation hedge and a critical material in the growing energy sector, especially solar deployment. "The metal's dual demand sources meant that it benefited from both economic recovery, which boosted industrial usage, and ongoing financial market uncertainties, which maintained strong investment inflows. This multi-faceted demand profile helped silver outperform other commodities that might rely more heavily on a single demand source, such as industrial use alone or as a hedge against inflation," the report stated.

To download a complimentary copy of the report, please click here.

Table 1: Impact of Key Geopolitical events on Silver and Gold Prices

Geopolitical Event	Event Dates	% change to peak Silver	% change to peak Gold
Iranian Hostage Crisis / Russia Invades Afghanistan	Aug 1979 to May 1980	395%	100%
Falklands Island War	Mar to May 1982	9%	16%
Iraq Invades Kuwait	Jul to Sep 1990	15%	17%
US Bombs Iraq (Gulf War)	Nov 1990 to Feb 1991	13%	11%
9/11	Sep 2001	11%	7%
Iraq War	Oct 2002 to Apr 2003	14%	21%
Madrid Terror Attacks	Mar to Apr 2004	17%	7%
Russia Invades Crimea	Jan to Dec 2014	14%	13%
North Korea Missile Crisis	Jul to Dec 2017	17%	10%
Iran Tensions and Attack on Saudi Oil Facilities	Jun to Dec 2019	25%	12%
Russia Invades Ukraine	Jan 2022 to May 2022	17%	13%
Hamas attacks Israel	Oct 2023 to Feb 2024	18%	10%

The % to peak is measured as the percent change in the asset prices from the trendline before the event to the peak of the geopolitical bump.

Source: LSEG, Reuters, Capitalight Research

The percent change in the silver price has exceeded the percent change in the gold price consistently for every geopolitical event listed in the table since 2004.

Anti-Counterfeiting Technology Features Silver

One of the disadvantages of silver nanoparticles is that they discolor when hit with ultraviolet light, depending upon the size and shape of the particles and the length of exposure.

However, this shortcoming is being used to advantage by a research team at the School of Energy and Chemical Engineering at the Ulsan National Institute of Science & Technology (UNIST), in South Korea, who have developed an anti-counterfeiting technology. "The technology we have developed holds significant promise in preventing the counterfeiting of valuable artworks and defense materials, particularly in scenarios where authenticity must be verified against potential piracy," said team member Jiseok Lee in *Phys.org*.

The researchers trapped silver nanoparticles inside a polymer matrix and noted that the polymer color ranged from yellow to red depending upon combinations of size and amount of silver particles. By using pixel-sized amounts of the silver/polymer mixture they produced high resolution, color images with precise hues. By embedding these images in materials that must be counterfeit-proof, they were able to tell real from fake by what color they became when beamed with Ultraviolet (UV) rays.

Another benefit of this technology is that the color changed with natural UV exposure from the sun, thus showing the image's age and therefore the material it was placed on. The researchers produced bar codes with this UV-aging ability giving exact temporal information about the material.

"The simplicity of the manufacturing process and the reproducibility of colors present a substantial opportunity for the advancement of information encryption systems, particularly in anti-counterfeiting applications," stated Byungcheon Yoo, the lead author of the study.

Nanosilver Applied to Potato Crop Results in Greater Nutritional Value

Potatoes are the third most consumed food crop after rice and wheat. They are also a source of energy and nutrition such as protein (not much, but more than most vegetables), fiber, vitamins, and elements such as potassium, magnesium, iron and phosphorus. Therefore, it's vital to make sure that this food source is kept robust and healthy.

One way in which farmers protect their potato crop is by spraying with chemicals that prevent fungus and bacteria but these can be toxic. A better idea is using nanosilver which has been shown to keep these microbes at bay.

To this end, a group of Polish scientists studied how varying amounts of nanosilver applied to potato tubers effected the nutritional value of potatoes, and their results are encouraging.

In their experiments, published in the journal Nature in September, "Lower amounts of silver ions were transported to the underground parts of the potato (tubers) when synthesized with SDS as a capping agent, rather than with citrate. (Both sodium dodecyl sulphate (SDS) and sodium citrate were used as stabilizing agents.) This method of synthesis was also more favorable in terms of nutritional properties of potato tubers."

They added: "Spraying with the highest tested concentration of AgNPs_SDS had a favorable effect on the nutritional parameters of potato tubers including a variety of macro and micronutrients, ascorbic acid and soluble sugars. On the other hand, lower concentrations of AgNPs_SDS improved the antioxidant properties of tubers, increasing the content of phenolic compounds and free radical scavenging efficiency. Based on these results further research is needed to verify if and how spraying with silver nanoparticles will affect the resistance of potato tubers plants to pathogens and pests during cultivation, as well as affect tubers upon prolonged storage conditions."

The team says it will continue to study what combination of nanosilver and stabilizing agents will result in the most nutritionally-packed potato with the best ability to ward off diseases.

U.S. DEPT. OF AGRICULTURE

Farmers are always looking for ways to protect their potato crops from disease. Nanosilver may help.

Larry Kahaner
Editor

THE SILVERINSTITUTE
1400 I Street, NW, Suite 550
Washington, DC 20005
T 202.835 0185

www.silverinstitute.org
@SilverInstitute on X