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SILVER NEWS

June 2026

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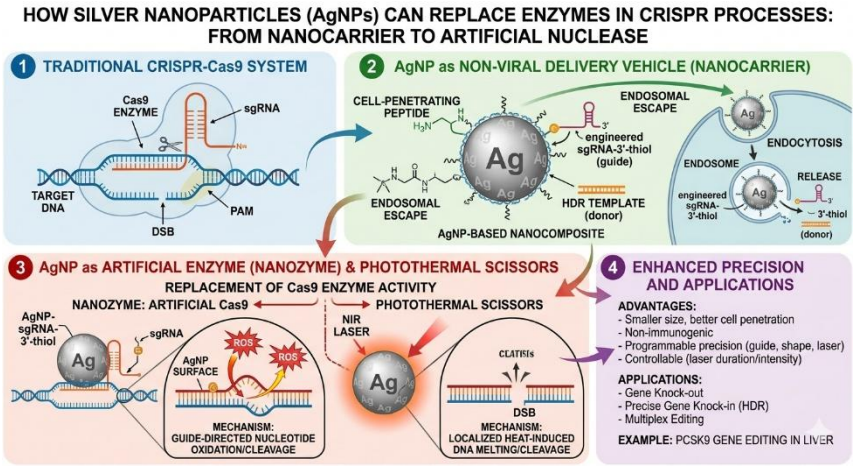
Silver Aids Genetic Researchers in Slicing and Rebuilding DNA

From producing new vaccines to insect-resistant vegetables, genetic engineering relies on cutting DNA strands at just the right location and then reconnecting them at other places. This gene-editing technology, commonly known as CRISPR – Clustered Regularly Interspaced Short Palindromic Repeats – is at the heart of all gene altering processes, and Japanese researchers recently have discovered nanosilver properties that aid the precise cutting and reconnection of DNA structures.

First, silver nanoparticles help to locate and trigger the best angle to cut the strands. Second, silver replaces enzymes that are usually used to split sites and does the job more cleanly. Third, the introduction of silver creates longer overhangs, thus making for tighter joints and, fourth, unused or waste DNA fragments are attracted to the silver and carried away. This last benefit alone increases the final DNA recovery rate from 14% to 98%, according to a research team led by Professor Hiroshi Abe and Assistant Professor Masahito Inagaki at Nagoya University, in collaboration with Professor Natsuhisa Oka at Gifu University. Their work was published in the journal *Nucleic Acids Research.*

Inagaki said in a prepared statement, "We believe this technology will be useful for synthesizing genomic DNA, with many possible applications in areas such as an mRNA library establishment for cancer vaccines and gene therapy, as well as the development of artificial protein drugs and genome crops." He added: "We have shown that two DNA fragments can be joined. Now, we need to confirm whether multiple fragments can be joined at the same time – a key step for building genome-scale DNA."



This is an example of how nanosilver can replace enzymes in the technology known as CRISPR, a gene-editing technology that allows scientists to precisely alter the DNA of living organisms.

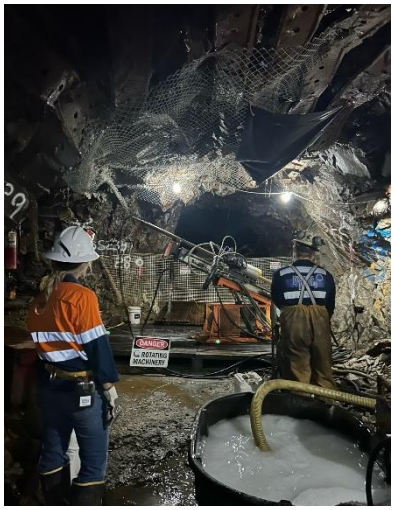
Illustration generated by AI

Bunker Hill Mine: The US's Newest Silver Mine Restarts Operations

After 45 years of closure, Bunker Hill Mining Corporation, a member company of the Silver Institute and operator of the Bunker Hill Mine in the western end of the Silver Valley in Northern Idaho, has resumed operations. Built to supply the US with domestically-sourced silver, zinc and lead from open argentiferous galena (lead-silver) and sphalerite (zinc) mineralisation, it represents the country's newest operating silver mine, and the first to restart mining operations at a government-mandated environmental Superfund site which has been remediated.

After producing 165 million ounces (Moz) of silver and 4.5 tons of base metals, the vertically integrated mining and smelting operation was closed in 1981 with the loss of over 2,000 jobs due to its inability to conform to US environmental regulations. Its facilities were dismantled, the underground mine flooded and the area fully remediated as part of the Environmental Protection Agency's Superfund Program.

In 2020, a team led by Richard Williams, former Barrick Chief Operating Officer, Sam Ash, Executive General Manager of Lumwana Mine, and Brad Barnett, the manager of Barrick's closed mines portfolio, arrived in Idaho. Inspired by its vast potential and the Environmental Protection Agency's wish to restore Superfund sites back to economic use, they took over the Bunker Hill Mining Corporation (TSX:BNKR, OTCQB:BHHL) aiming to bring it back to life.



Bunker Hill, a previous Superfund site, has been remediated and is back on line.

Source: Bunker Hill

Six years later, in partnership with Teck – the company's largest shareholder – the new 1,800-2,500 tons per day processing facility is receiving ore from its mechanized, modern underground operation. The mine already has created 200 full-time jobs.

Silver 'Glue' Could Cut Down on E-Waste

Soldering is the gold standard when it comes to connecting electronic components to printed circuit boards in consumer devices like smartphones and televisions. Unfortunately, however, solder, in addition to screws and other connectors, makes it difficult to recycle e-waste because of its strong bonds to the printed circuit board.

Now, engineers at Newcastle University in England have developed a kind of 'reversible 'glue that uses silver particles to keep electricity flowing to components while making recycling easier. The silver/glue combination offers an alternative to solder – often containing toxic lead – as well as taking the place of screws and other metal connectors.

An easily-dissolved 'glue' containing nanosilver particles makes e-waste recycling cheaper and more efficient.

Ama Asiedu-Asante, co-author of the engineers' study in the journal Advanced Electronic Materials, said in a prepared statement: "It's not just about solder. The electronics industry relies on permanent joining methods, including screws, which can make automated recycling more difficult. There is now increasing recognition that water-based formulations can support more sustainable electronics, and this work demonstrates how they can deliver both performance and reversibility."

Using silver-based glues in electronics is not new, but this new conductive adhesive stands entirely alone in its ability to be easily dissolved and unbonded on demand. A university statement noted: "… unlike permanent solder, this new adhesive can be easily dissolved in an alkaline solution or a green solvent such as acetone. It could allow electronic parts to be cleanly separated for reuse and recycling. This 'one-pot,' water-based glue is manufactured just like standard paint, but it swaps out color pigments for conductive silver particles to achieve its unique electrical properties."

The problem of e-waste is getting worse. According to E-Waste Monitor, a United Nations publication, only about 22.3% of the world's electronic waste is properly recycled. Global e-waste generation is estimated at 62 million tons, meaning that nearly 48 million tons are discarded annually. Not only does this adversely affect the environment, but it represents a loss of tens of billions of dollars' worth of recoverable material.

Silver Keeps AI Chips and Data Centers Cooler

Silicon Carbide (SiC) chips serve as the crucial backbone for Artificial Intelligence (AI) infrastructure. Unlike computer chips that operate at low power as they handle data, SiC chips manage and deliver the massive amount of electrical power needed at data centers. While these chips can tolerate higher temperatures better than standard silicon chips, sustained heat in a crowded server rack can destroy or degrade them.

The heat generated by these chips can cause bonding failures (the chips separate from the substrate or packaging that holds them together) but engineers have shown that the chips can operate in heat as high as 350°C when sintered with silver paste. Sintering is the process of fusing powdered silver using heat and compression.

Silver is an excellent conductor of heat, serving to diffuse the high temperatures that cause oxidation and failure. SiC chips often operate at temperatures of about 175°C, so testing at 350 degrees offers a robust safety factor.

In the journal Microelectronics Reliability, researchers noted that silver did better than other metals they tested. "The copper surface of substrate could not meet the high-temperature application due to the oxidation. The shear strength of die attachment with gold surface was either poor initially or rapidly degraded with aging at 300°C, while the die attachment with silver surfaces had the excellent shear strength."

Silver plays a crucial role in keeping data centers cooler.

Abaxx Exchange Launches Silver Singapore (SSP) Futures

As silver industrial supply chains grow alongside rising investment demand, an active, two-way physical market has expanded across Asia. However, global price discovery has remained anchored to legacy hubs in London and New York. For commercial participants managing physical trade in Asia, this geographic mismatch introduces severe basis risk, timing friction, and unnecessary logistical costs.

On May 22, Abaxx Exchange launched Silver Singapore (SSP) futures to help address this gap. The contract is a US dollar-denominated, 1,000 troy ounce, physically deliverable contract for silver of 0.9999 fineness, with delivery into approved vaults in Singapore. Built for commercial trade, SSP aligns with regional physical realities by requiring four-nines silver, the higher-purity material needed by many industrial users to reduce unnecessary reprocessing or quality swap costs.

During its first 14 days of trading, SSP volume surpassed 30,000 contracts. The contract gives participants a regional alternative to moving surplus inventory back to Western hubs, reducing exposure to freight volatility, tariff uncertainty, and financing drag. It is designed to mitigate basis risk between legacy three-nines benchmarks and regional four-nines

requirements, offering a more direct mechanism to hedge and settle trade during the Asian business day.
Trading hours are 10:00 to 24:00 Singapore Time (SGT), Monday to Friday. Full contract specifications and market access details are available at abaxx.exchange/markets/precious-metals.

Abaxx Exchange

Source: Abbaxx

Silver-Linalool Combo Holds Promise for Shrinking Brain Tumors

Linalool is a naturally occurring alcohol found in over 200 plants – including mint, laurel and citrus. It is being tested for its ability to shrink brain tumors, and silver is aiding that research.

Researchers in Saudi Arabia and Pakistan have found that while Linalool (LN) may hold promise for brain tumor patients, it has trouble breaching the brain/body protective barrier. They have found, though, that by adding silver nanoparticles to Linalool, a chemical that researchers call LN@AgNP, Linalool more easily reaches the brain and interacts with tumors.

The LN@AgNP concoction was tested in three ways: computer simulations, laboratory tests and on rats. The experiments showed that attaching Linalool to silver nanoparticles makes the drug more stable and more able to block proteins that fuel the growth of cancer. The tests showed that in rats the nanomedicine shrank brain tumors by 13 percent. In addition, rats injected with silver-laced Linalool survived longer without the usual toxic side effects caused by traditional chemotherapy or radiation treatments.

Writing in the peer-reviewed journal *Scientific Reports,* the researchers noted: "In conclusion, we have shown that LN@AgNPs are a promising phytochemical-based nanomedicine with strong potential for treating brain tumors… Pharmacokinetics, biodistribution, and long-term safety in patient-derived models should be examined in future research. To bring this promising strategy closer to clinical use, it will also be required to enhance nanoparticle design and investigate combination therapies with conventional drugs."

Lavender is a source of Linalool, a natural chemical, which, when mixed with nanosilver particles, holds promise for shrinking brain tumors.

Making Silver Electroplating Safer and More Environmentally Friendly

New Method Keeps Electroplate Thick and Uniform for Precise Electronic Parts

Traditional silver plating often uses toxic chemicals that, if not used properly, can be dangerous to workers and the environment.

Now, new research from Korea shows that using an acidic, phosphorous-based liquid instead of chemicals offers a way to electroplate silver in a safer way without sacrificing smoothness or thickness. This discovery allows for expanded use of silver electroplating for companies that do not want workers to handle dangerous chemicals or worry about their release into the environment.

When researchers previously tried to use non-toxic acidic baths, they encountered several problems. The most important was that silver ions clumped together, making smooth plating impossible. The silver left the solution and ended up as a powder.

Adding phosphorous, however, provided a kind of chemical shield around the ions keeping them from crashing together. It also kept the silver ions from precipitating out. Most important is that the phosphorous slowly released the silver, allowing the plating to be smooth and uniform while keeping the film thick and tough. For the electronics sector, thick, uniform silver plating is crucial for precise and consistent operation of microchips and semiconductors. Moreover, the phosphorus-based bath remained highly stable and used an easy-to-manage formula.

The researchers were from Energy & Environment Materials Research Division, Korea Institute of Materials Science, Changwon and the Department of Materials Science and Engineering, Pusan National University, Busan.

Who Needs Perfect Nanosilver Crystals when Defective Ones Work Better?

Although silver is often used as a catalyst in chemical reactions, it is relatively weak compared to more active catalysts like gold or platinum. On the other hand, silver is more cost effective compared to these precious metals, as well as being more abundant and sustainable.

The key to making silver a better catalyst, according to a recent chapter in a volume titled: "Silver Nanoparticles – Fundamentals, Properties, Synthesis, and Applications," is to *purposely* introduce defects into nanosilver crystals.

The defects are introduced by several methods including using chemicals, applying electric pulses and shooting lasers at the silver crystals. Although scientists don't fully understand the mechanism that occurs, they know that the imperfections in the silver nanoparticles alter their electronic behavior. "Crystal defects can effectively regulate the electronic structure of silver and affect its adsorption ability, thus improving its catalytic activity," author Phuong V. Pham wrote.

Pham noted that the defective silver crystals outperformed platinum in several applications. For example, the defects created so-called 'atomic strain' which helped silver bond better with hydrogen items producing more hydrogen gas to use as green fuel. The 'defective' nanosilver also produces carbon dioxide more efficiently – a precursor to industrial carbon monoxide gas. Again, this reduces greenhouse gases.

This work was supported by several organizations including the National Natural Science Foundation of China, the Beijing-Tianjin-Hebei Fundamental Research Cooperation Project, Science and Technology Research Program of Chongqing Municipal Education Commission, and the Startup Foundation of Chongqing Normal University.

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