THE SILVERINSTITUTE

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Silver News

Silver Continues Role as Vital Component of Solar Cells

Sun-Powered Generation Expected to Double by 2025: Report

CRU

Large arrays of photo panels are often seen on rooftops and in open fields.

With solar power generation expected to nearly double by 2025, silver will continue to be a vital component of photovoltaic (PV) cells, which are arranged together to produce large solar arrays often seen on building roofs and in open fields.

To explore silver's role in the global solar power market in detail, the Silver Institute commissioned a report, *Silver's Important Role in Solar Power*, produced by London-based metals consultancy CRU Consulting (CRU), as part of its series of Market Trend Reports.

The report examines trends in solar power generation and provides regional perspectives on future demand for solar installations. Growth in solar power capacity over the next decade is expected to be led by China, according to the report, followed by Europe, North America, other developed Asian countries and India.

The report maintains that a combination of global efforts to reduce fossil fuel reliance, legislation to lower carbon emissions, and favorable government tax policies, should result in a continued expansion of solar panel installations over the next decade. For example, policies in California today mandate that new residential homes be built to include a solar electricity system. Solar power is also a competitive option for power generation at industrial sites, particularly in remote locations with sunny conditions, such as mine sites in South Africa, Chile, and Western Australia, providing further upside for silver and solar demand.

Importantly, with silver possessing the lowest electrical resistance among all metals at standard temperatures, potential substitute metals cannot match silver in terms of energy output per solar panel. Further, due to technical hurdles, non-silver PVs tend to be less reliable and have shorter lifespans, presenting serious issues for their widespread commercial development.

The Silver Institute is releasing a series of Market Trend Reports this year, focusing on key sectors of silver demand to bring awareness to silver's varied and growing demand portfolio, and this report is part of that series.

To download a copy of the report, click here.

Silver Helps Superconductor Research Move Forward

Superconductors are materials that have zero or close to zero electrical resistance at extremely low temperatures. The major challenge is that cooling is expensive, because it is usually accomplished with liquid nitrogen. A long-term quest for engineers has been to produce a superconductor without the requirement for such low temperatures, perhaps even at ambient temperatures.

If possible, this would open up new applications for superconductors not only for electrical transmission systems but also for 'supermagnets' employed in high speed Maglev (magnetic levitation) trains which are operating in China, Japan, Germany, France and Spain. Supermagnets are also found in medical equipment such as Magnetic Resonance Imaging (MRI) machines.

Scientists at Tokyo Metropolitan University say they have created a new superconductor material with a conducting layer made of bismuth, silver, tin, sulfur and selenium. Silver is one of the world's best electrical conductors.

Starting with a layer of bismuth, silver and sulfur, they tested different amounts of silver, substituting it for tin. By varying the amount of silver, they were able to raise the critical temperature from -272 degrees C (-458 degrees F) to above -271 degrees c (-456 degrees F). While this might not seem much of a difference to most of us, these experiments prove that higher temperatures along with superconductivity is attainable simply by varying the amount of silver and other components.

Silver Nanowires Key to Breathable/ Wearable Electronics

Can be Worn Long Term Without Sweat or Skin Irritation

One of the drawbacks of wearable electronics, such as heart and respiration monitors, is that the material doesn't breathe and becomes sweaty against the wearer's skin, especially after many hours of use. This can not only cause odor and discomfort but also skin irritation. The challenge for designers is to create an ultrathin, gas-permeable, stretchable material that can also conduct electricity.

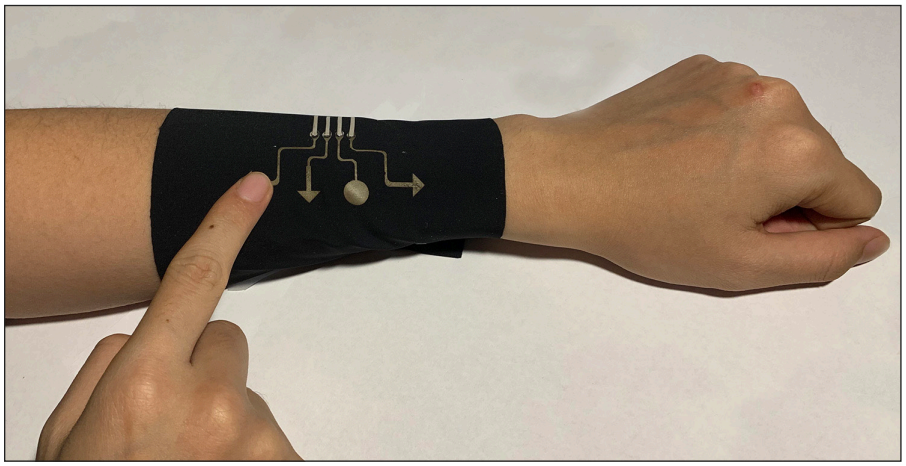
Engineering researchers at North Carolina State University may have found a solution. The group produced a stretchable polymer film with a large number of almost-microscopic holes. The film is then dipped in a solution that contains silver nanowires which are heat pressed to seal the wires in place. The holes let the skin 'breathe' while the wires allow the wearable to conduct electricity and even act as mini-switches.

"The gas permeability is the big advance over earlier stretchable electronics," said Yong Zhu, co-corresponding author of a peer-reviewed journal article on the work and a professor of mechanical and aerospace engineering. "But the method we used for creating the material is also important, because it's a simple process that would be easy to scale up," he said in a prepared statement.

He added: "The resulting film shows an excellent combination of electric conductivity, optical transmittance and water-vapor permeability, and because the silver nanowires are embedded just below the surface of the polymer, the material also exhibits excellent stability in the presence of sweat and after long-term wear."

Zhu noted that the holes keep the material from becoming sweaty and uncomfortable, and because it is gas permeable, the material also reduces the skin irritation found with some other wearables. The first prototype is being tested as skin sensor electrodes which could be used for electrocardiography (ECG) and electromyography (EMG) signals. "These sensors were able to record signals with excellent quality, on par with commercially available electrodes," Zhu added.

The second prototype was used as a wearable game controller that could play simple computer games like *Tetris*.



Click the image to view a video of how this breathable-wearable sleeve works.

Silver May Help Power the Next Generation of Personal Protection Equipment

Small amounts of electricity have been shown to kill many germs, so one company is building tiny silver/zinc batteries into face masks to keep the wearer safe from infection.

Vomaris Innovations, Inc., Tempe, Arizona, currently produces a polyester fabric wound dressing imbedded with tiny silver and zinc spots that resemble polka dots. The particles are 2 millimeters wide and spaced about 1 millimeter apart.

When moisture is introduced to the fabric, the silver and zinc become tiny batteries (Silver/zinc batteries are used in everyday consumer devices) that produce a small electrical current. In the case of dressings, natural oozing from the wound known as 'serous fluid' activates the batteries and promotes healing by killing bacteria.

For a face mask, the activating moisture would come from exhalation.

The company is currently testing face masks using their fabric to see which microbes, including those that cause COVID-19, might be killed on contact with the material.

VOMARIS

Click the image to watch a video of how silver/zinc particles imbedded in fabric can protect against infections.

Insignia Offers Silver-Based 'Clean Card'

Luxury financial and lifestyle management group Insignia (New York City and London) has developed a silver-coated credit card that kills germs. Company officials noted that during the COVID-19 pandemic more consumers were using cards instead of cash to buy items in the hope that using their card will cut down on transmission of dangerous bacteria.

Their studies showed that the best germ-killing power on their *Clean Card* occurred when a silver coating was applied to cards made of layers of titanium or zinc. The company's study of hands, money and credit cards which were swabbed for germs revealed that bacteria were found on 11 percent of users' hands, 8 percent of credit cards and 6 percent of paper receipts. Tests also showed that the coating killed almost 99.9 percent of germs.

INSIGNIA

Insignia's silver-coated 'Clean Card' protects users against bacteria.

Silver and Gold Nanoparticles Produce Environmentally-Safe Ceramic Glazes

Wide Range of Colors Become Available at Low Cost

Methods for producing glazes for ceramics often use toxic heavy metals like barium and cadmium, but chemists at the University of Richmond in Virginia have resurrected an older and safer way to color pottery: silver and gold nanoparticles.

Glazes, which are applied to ceramics before firing in a kiln, make pottery shiny, waterproof and add color, but too often the glazes are dangerous to people and the environment. “Even today, you can still find ceramic glazes on the market that contain harmful heavy metals,” said Ryan Coppage, Ph.D., the project’s principal investigator, in a prepared statement. “Achieving the brightest colors has traditionally required using higher amounts of heavy metals, such as barium and cadmium, which can leach from the surface and are toxic at such levels.”

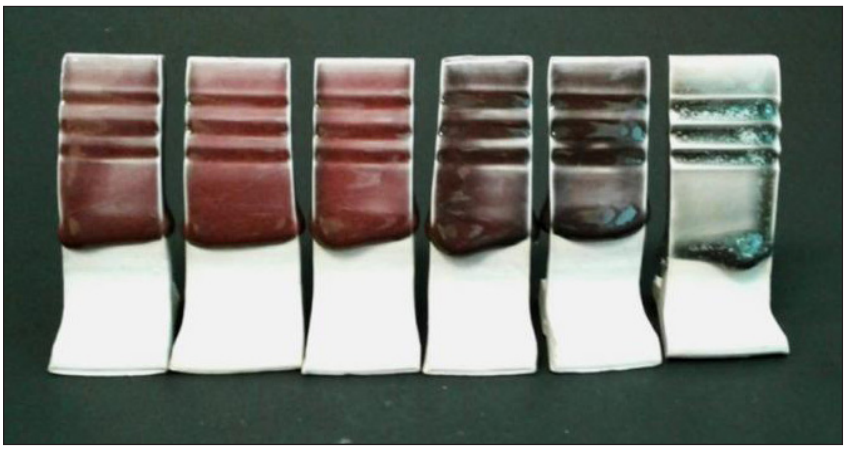
Coppage and his team learned that silver and gold nanoparticles have been used for centuries and decided to emulate the methods of artisans of the past using modern technology. “In medieval times, artisans would grind silver and gold into a fine powder or use gold or silver salts to create vibrantly-colored, stained-glass windows and chalices,” said team member Nathan Dinh.

Dinh said that larger particles of silver and gold show their usual white and yellow colors, but when they are ground down to nanoscale they exhibit many different colors. In fact, the colors change based on the particle size. Nanosilver particles can show as red or even bright green while nanogold can produce dark red and dark blues.

The scientists started their coloring experiments with a simple glaze base and separately mixed in various amounts of silver and gold salts and nanoparticles. They fired the ceramics in kilns and found that the heating process changed the size and shapes of the metals which, in turn, yielded different colors. The resulting colors also depended upon the concentrations of the metals. By mixing both metals in the same glaze, altering the amounts of each and changing the temperature, they could produce a wide range of hues.

Not only is the glaze environmentally friendly but also cost effective; a single cup of glaze with silver and gold costs between 30 and 40 cents (US). The researchers also found that they didn’t need much gold or silver in the glaze – about 0.01 percent by weight – compared to glazes with dangerous heavy metals which often contain 5 to 15 percent by weight.

Coppage’s team expect to continue experimenting with producing more colors and ranges using silver, gold and other nanoparticles.



RYAN COPPAGE

Ceramic samples were coated with glazes made with silver and gold nanoparticles that are less toxic than conventional colorants.

Silver Coin Honors UK Medical Workers' Service During Pandemic

The East India Company in partnership with the British Overseas Territory of St. Helena has struck a one-ounce, pure-silver coin in honor of services performed during the COVID-19 pandemic by UK's National Health Service (NHS) workers.

Profits from the coin's sales will be donated to the NHS Charities Together Coronavirus Appeal.

In a prepared statement, the Governor of St. Helena, Dr. Philip Rushbrook, said: "I'm pleased this coin is recognizing the tremendous work of the doctors and nurses in the NHS. I would also like to take this opportunity to honor the medical staff, St. Helena Government, U.K. Government and many other people on St. Helena who have also been preparing for the battle against the COVID-19 virus at this deeply-concerning time."

The cost of the £5 legal tender, one-ounce silver coin is £24.95.

Profits from the sale of St. Helena's one-ounce silver coin will benefit the UK's National Health Service charities.

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