PRESS RELEASE

TANAKA Develops Lead-Free Precious Metal Quantum Dot Material for Near-Infrared and Short-Wave Infrared Sensing Through Joint Research with Nagoya University

Suitable for a Broad Range of Infrared Sensing Applications, from Smartphones to Biomedical Uses, with Samples Available from January 2027

Tokyo, Japan, October 20, 2026 - TANAKA PRECIOUS METAL TECHNOLOGIES Co., Ltd. (Head Office: Chuo-ku, Tokyo; CEO: Koichiro Tanaka), a company engaged in the industrial precious metals business of TANAKA, has developed **a lead-free precious metal quantum dot material responsive to near-infrared light** through joint research with the Torimoto Laboratory at Nagoya University, Tokai National Higher Education and Research System. The new material offers a detection wavelength range comparable to that of conventional lead-based quantum dot materials while containing neither lead (Pb) nor cadmium (Cd). This makes the material promising for use in consumer electronics such as smartphones and in medical fields such as biosensing. Samples are scheduled to become available in January 2027.

This material will be presented at Okinawa Colloids 2026, an international conference to be held in Okinawa from November 1 to 6, 2026, and at nano tech 2026: The 26th International Nanotechnology Exhibition & Conference, to be held from December 16 to 18, 2026.



<Photograph of Precious Metal Quantum Dot Products>

■ Background to Development

Infrared sensing technologies are increasingly being applied in a wide range of fields, including 3D sensing and wearable devices, facial recognition on smartphones, industrial inspection cameras, automotive LiDAR, and biosensing. These infrared sensing applications rely on photodetector materials that are sensitive to infrared light.

For these applications, indium gallium arsenide (InGaAs) has conventionally been used as the primary photodetector material. Although it can detect infrared light at wavelengths of up to 1,700 nm with high sensitivity, its manufacturing process is complex, involving the use of vacuum processes, and yield and

cost during mass production remain challenges. Demand for indium (In), meanwhile, has recently been growing rapidly in cutting-edge fields such as next-generation high-speed communication semiconductors for AI data centers, perovskite solar cells, and smartphone displays. However, indium production is limited relative to demand, raising concerns about stable supply.

In contrast, quantum dot materials (semiconductor nanoparticles) made from lead sulfide (PbS) are being explored as an alternative to conventional InGaAs for infrared photodetection. These materials can be produced at low cost using printing processes while providing high sensing performance.

Quantum dots are semiconductor particles several nanometers in size. Their distinctive feature is that the wavelengths of light they absorb and emit can be adjusted by controlling particle size. When integrated into sensors, they can also be deposited using printing processes suitable for large-area production. Sensors can therefore reportedly be manufactured at approximately one-tenth the cost of InGaAs sensors. However, PbS, a representative quantum dot material, contains lead, a substance regulated under the RoHS Directive, and its use in consumer electronics is therefore restricted. These restrictions reflect concerns over the effects of lead on human health and the environment.

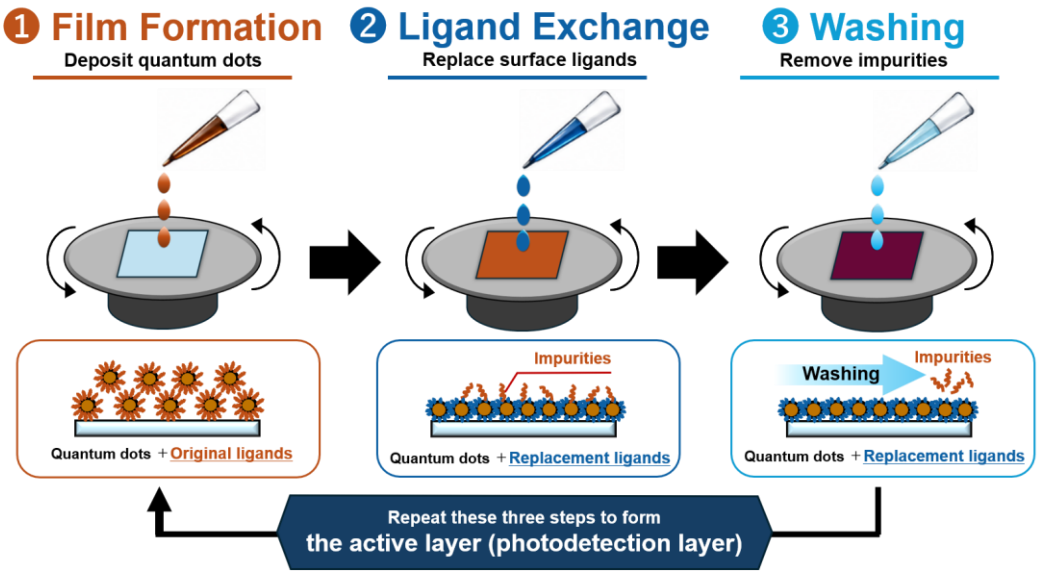
To address these challenges, TANAKA and Nagoya University have developed a next-generation lead-free quantum dot material composed primarily of precious metals.

■ Features of the Precious Metal Quantum Dot Material Developed by TANAKA

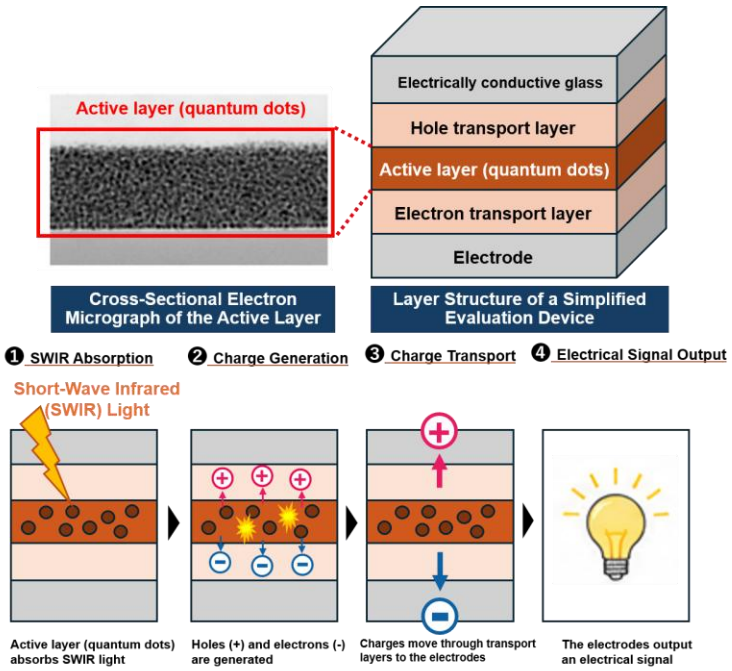
Developed by TANAKA through joint research with Professor Torimoto of Nagoya University, this compound semiconductor quantum dot material is composed primarily of precious metals and is sensitive to infrared light. Like other quantum dot materials such as PbS, it requires no vacuum process and can be deposited using printing processes suitable for large-area production. It is therefore expected to simplify the manufacturing process and reduce process costs.

In performance evaluations conducted by TANAKA, the newly developed silver-sulfur-tellurium (Ag-S-Te) quantum dots were incorporated as the active layer (photodetection layer) in a simple photosensor, which achieved a maximum external quantum efficiency (EQE) of 18.4% for short-wave infrared (SWIR) light in the 1,200–1,700 nm wavelength range. This wavelength range is less susceptible to noise from sunlight and the effects of adverse weather, enabling high-precision sensing outdoors. Light in this wavelength range also offers greater eye safety and readily penetrates materials and biological tissue.

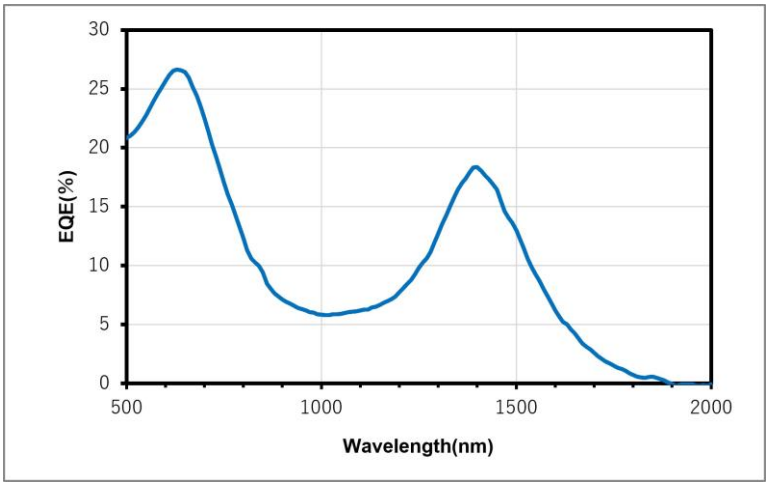
This development is expected to enable practical applications across a wide range of fields where the adoption of high-performance infrared sensors has previously been limited by cost and lead restrictions. These include consumer electronics such as smartphones (3D sensing for facial recognition and other functions), automotive LiDAR, industrial inspection cameras, and biosensing.



a) Schematic of the process for forming an Ag-S-Te active layer (photodetection layer) by printing



b) Cross-sectional electron microscope image of the stacked quantum dot material and layer structure of a simplified evaluation device



c) Wavelength dependence of external quantum efficiency (EQE) under irradiation with visible to short-wave infrared light

In addition to photodetector materials for SWIR sensing, TANAKA is developing luminescent materials for infrared applications using highly biocompatible elements. This quantum dot material can be applied to targeted imaging, in which specific lesions or cells are made to emit light for high-precision visualization. Because precious metal quantum dot materials contain no hazardous substances with high toxicity to living organisms, such as lead or cadmium, they also show promise for biomedical applications.

■ Quantum Dot Material Customization and Recycling Technologies

Through joint research with Nagoya University, TANAKA has been developing technologies for controlling quantum dot material composition and particle size and for modifying particle surfaces. By using these technologies, TANAKA will offer optimal quantum dot materials tailored to customer requirements and applications, including customized optical properties such as light absorption and emission and improved process compatibility.

In addition, although precious metals are used as the primary components of this quantum dot material, TANAKA's long-established precious metal recycling technologies will help reduce material costs. By recovering and refining precious metals from scrap generated during manufacturing and from used samples following customer evaluation and testing, TANAKA will help reduce initial evaluation costs during introduction and optimize operating costs during mass production.

■ Future Outlook

This development will help realize safe and sustainable next-generation sensing technologies by providing a material that does not use indium, for which supply constraints are a concern, or lead, which is regulated under the RoHS Directive, and is expected to be well suited to mass production through printing processes. Drawing on its long-established precious metal materials technologies, TANAKA will continue improving the performance of precious metal quantum dot materials and developing applications, while pursuing real-world implementation in fields ranging from next-generation sensing to biomedical applications.

【About Nagoya University】

Nagoya University is a comprehensive university with a history spanning more than 150 years, tracing its roots to a temporary hospital and school established in 1871. Under its tradition of a "free and open-minded" academic culture, the university advances education and research at the highest global standards. Through sustained creative activities in research and education, the university pursues its mission of cultivating courageous intellectuals, strengthening its academic foundations, generating world-class intellectual achievements, and contributing to society.

For more information, please visit https://en.nagoya-u.ac.jp/

■ About TANAKA

Since its foundation in 1885, TANAKA has built a portfolio of products to support a diversified range of business uses focused on precious metals. TANAKA is a leader in Japan regarding the volume of precious metals it handles. Over many years, TANAKA has manufactured and sold precious metal products for industry and provided precious metals in such forms as jewelry and assets. As precious metals specialists, all Group companies in Japan and worldwide collaborate on manufacturing, sales, and technology development to offer a full range of products and services.

With 5,778 employees, the group's consolidated net sales for the fiscal year ended December 2025 were 1,097,813 million yen.

■ TANAKA Industrial Precious Metal Materials Portal

https://tanaka-preciousmetals.com

■ Product inquiries

TANAKA PRECIOUS METAL TECHNOLOGIES Co., Ltd.

https://tanaka-preciousmetals.com/en/inquiries-on-industrial-products/

■ Press inquiries

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