

July 8 , 2014

Tanaka Precious Metals
Tanaka Holdings Co., Ltd.

TANAKA Develops Silver Paste Able to Form Electronic Circuits Using UV Curing to Support Screen Printing

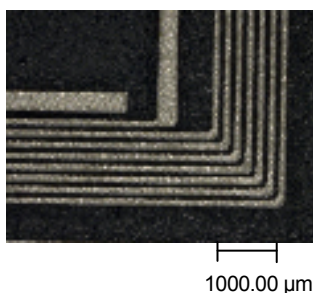
With 70 micrometer micro wiring, the same stable electrical conductivity is ensured
Significant reduction in manufacturing time provides improved productivity compared to
screen printing using thermal curing

Tanaka Holdings Co., Ltd. (a company of Tanaka Precious Metals; Head office: Marunouchi, Chiyoda-ku, Tokyo; President & CEO: Akira Tanae) today announced that Tanaka Kikinzoku Kogyo K.K. (Head office: Marunouchi, Chiyoda-ku, Tokyo; President & CEO: Akira Tanae), which operates the Tanaka Precious Metals' manufacturing business, has developed UV700-SR1J, a product supporting screen printing of electrically conductive silver paste enabling the formation of electronic circuits using only ultraviolet (UV) curing without thermal curing. TANAKA will conduct demonstrations at SEMICON West 2014, a tradeshow located in San Francisco from July 8 (Tue) until July 10 (Thu), 2014.

UV700-SR1J makes it possible to form a circuit that carries current by printing a circuit on base material with silver paste using screen printing technology, and exposing it to UV light for around 10 seconds, which instantly hardens the printed film even at room temperature. The technology enables narrower width than in conventional screen printing, resulting in the creation of micro wiring with a width of 70 μm (film thickness of 10 μm or more; micrometer is a millionth of 1 meter) and electrical resistivity of $10^{-4} \Omega\text{cm}$ (10 to the power of minus 4 ohm per 1 centimeter) on surface-treated PET film, providing electrical conductivity equal to UV-curable and thermally curable silver pastes used in conventional flexographic printing.

— Features of UV700-SR1J —

- Fine wire width of 70 μm and electrical resistivity of $10^{-4} \Omega\text{cm}$ providing electrical conductivity equal to UV-cured and thermally cured silver pastes used in conventional flexographic printing
- Curable high UV transmission even at a film thickness of 10 μm
- Printable on flexible base materials susceptible to heat, such as PET film, because UV curing is used instead of thermal curing
- Compatible with small to medium volume production of a large variety of products
- Treatment time is shortened compared to screen printing pastes using thermal curing



Enlarged figure of an electronic circuit created with UV700-SR1J using screen printing

■ Anticipation of UV-curable pastes for screen printing and actual development

In January 2012, Tanaka Kikinzoku Kogyo developed the world's first UV-curable silver ink and began supplying products supporting flexographic printing. Wiring technology to that point formed electronic circuits by heating ink and pastes, but the ability to use UV curing made it possible to form wiring on flexible base materials such as polyvinyl chloride (PVC) film and PET film, which are susceptible to heat. This was expected to have applications in the electronic circuitry of a wide range of products, such as dye sensitized solar cells, touch panel displays, organic EL lighting, electronic books and RFID (radio-frequency identification) tags. Meanwhile, in the field of printed electronics with many development elements, although flexographic printing is suitable for mass production, there is higher demand for screen printing enabling small to medium volume printing of a wide variety of products, and the lineup of UV-curable silver ink was anticipated to expand.

Because screen printing is a method that applies paste through a mesh with openings in the plate, the ink needs to be a paste with thixotropy^(*) to prevent bleeding when the plate is separated and adhesiveness suitable for adhering to the base material, and the silver particles contained in the paste must be fine enough to pass through the mesh. Furthermore, while flexographic printing, which is a type of letterpress printing can create wires with a thickness of 5 μm , screen printing produces wires with paste more than double the thickness of ink due to the thickness of the mesh plate, and preventing the paste from curing because UV light could not pass through it when the conventional flexographic printing process is applied. By reviewing the composition of the resin and silver particles that are the main components of silver paste, Tanaka Kikinzoku Kogyo succeeded in developing this UV-curable product that enables the formation of submicroscopic circuits while ensuring the stable electrical conductivity required for printed electronics. The curing speed has also been significantly reduced from several hours required for thermal curing to around 10 seconds with UV700-SR1J, which will contribute to improvements in customers' productivity.

■ Expanding applications and areas of interest

UV700-SR1J, which contains microscopic silver particles enabling screen printing, provides electrical conductivity with a wire width of 70 μm , and can improve the transparency of products such as touch panels. In addition, because it does not require thermal curing, it can be used to form wires on all kinds of film-like base materials that are susceptible to heat. This is expected to lead to applications in the latest technology such as antennas for highly flexible wearable devices, electronic packaging for medication management, and dye sensitized solar cells.

* Thixotropy:

The property exhibited by paste in gel form, where it becomes less viscous when the mesh plate is pressed against it, and viscosity returns when the plate is removed and the pressure released.



UV700-SR1J product sample

■**Tanaka Holdings Co., Ltd. (Holding company of Tanaka Precious Metals)**

Headquarters: 22F, Tokyo Building, 2-7-3 Marunouchi, Chiyoda-ku, Tokyo

Representative: Akira Tanae, President & CEO

Founded: 1885

Incorporated: 1918

Capital: 500 million yen

Employees in consolidated group: 3,895 (FY2012)

Net sales of consolidated group: 839.2 billion yen (FY2012)

Main businesses of the group:

Manufacture, sales, import and export of precious metals (platinum, gold, silver, and others) and various types of industrial precious metals products. Recycling and refining of precious metals.

Website: <http://www.tanaka.co.jp/english> (Tanaka Precious Metals),

<http://pro.tanaka.co.jp/en> (Industrial products)

■**Tanaka Kikinzoku Kogyo K.K.**

Headquarters: 22F, Tokyo Building, 2-7-3 Marunouchi, Chiyoda-ku, Tokyo

Representative: Akira Tanae, President & CEO

Founded: 1885

Incorporated: 1918

Capital: 500 million yen

Employees: 1,455 (FY2012)

Sales: 808.6 billion yen (FY2012)

Main businesses:

Manufacture, sales, import and export of precious metals (platinum, gold, silver, and others) and various types of industrial precious metals products. Recycling and refining of precious metals.

Website: <http://pro.tanaka.co.jp/en>

<About the Tanaka Precious Metals>

Established in 1885, the Tanaka Precious Metals has built a diversified range of business activities focused on the use of precious metals. On April 1, 2010, the group was reorganized with Tanaka Holdings Co., Ltd. as the holding company (parent company) of the Tanaka Precious Metals. In addition to strengthening corporate governance, the company aims to improve overall service to customers by ensuring efficient management and dynamic execution of operations. Tanaka Precious Metals is committed, as a specialist corporate entity, to providing a diverse range of products through cooperation among group companies.

Tanaka Precious Metals is in the top class in Japan in terms of the volume of precious metal handled, and for many years the group has developed and stably supplied industrial precious metals, in addition to providing accessories and savings commodities utilizing precious metals. As precious metal professionals, the Group will continue to contribute to enriching people's lives in the future.

The eight core companies in the Tanaka Precious Metals are as follows.

- Tanaka Holdings Co., Ltd. (pure holding company)
- Tanaka Kikinzoku Hanbai K.K.
- Tanaka Denshi Kogyo K.K.
- Tanaka Kikinzoku Jewelry K.K.
- Tanaka Kikinzoku Kogyo K.K.
- Tanaka Kikinzoku International K.K.
- Electroplating Engineers of Japan, Limited
- Tanaka Kikinzoku Business Service K.K.