

September 11, 2012

Tanaka Precious Metals  
Tanaka Holdings Co., Ltd.

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## **Tanaka Precious Metals Develops High-temperature Thermometer Wire Ten Times Conventional Strength - Samples Available from September 12**

- The world's highest strength wire significantly suppresses breakdowns of temperature measuring instruments used in steel, semiconductor and glass manufacturing -
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Tanaka Holdings Co., Ltd. (a company of Tanaka Precious Metals, Head office: Chiyoda-ku, Tokyo; President & CEO: Hideya Okamoto) today announced that Tanaka Kikinzoku Kogyo K.K. (Head office: Chiyoda-ku, Tokyo; President & CEO: Hideya Okamoto), which operates the Tanaka Precious Metals' manufacturing business, became the world's first to succeed in the development of a thermocouple (high-temperature thermometer) wire with ten times the strength of conventional products, and announces the provision of samples from September 12.

The developed "TEMPLAT" thermocouple wire is a wire used in type R thermocouples able to measure high temperatures in the range of 1,000 to 1,600°C when controlling the temperature in the process of manufacturing steel, semiconductors or glass. Comparing the creep strength<sup>(\*)</sup> of the commonly used 0.5mm-diameter type R thermocouple when breaking after 100 hours of use at 1,400°C, wire using conventional technology breaks under the extremely small force of 2 megapascals (MPa), but the newly developed thermocouple wire does not break until 20MPa of applied stress. By increasing creep strength at high temperature by ten times, it will be possible to significantly suppress the breakage problems that frequently troubled the users of type R thermocouples.

### **■ Issues for reducing breakage**

The thermocouple is an electric circuit made by joining wires of two different metals together forming a high-temperature thermometer that is able to determine temperature based on voltage (thermoelectric power) by utilizing the phenomenon of voltage being produced when there is a difference in the temperature of the joint and the base. The properties such as usable temperature range and measurement precision vary depending on types, and users choose the types according to their uses.

Type R thermocouples can be used in oxidizing atmospheres over 1,000°C, and is optimal for temperature control when manufacturing steel, semiconductors and glass, but there is a shortcoming of being susceptible to breakage under high temperature. The reason of breakage is due to the low strength of platinum used on the negative electrode, and especially its extremely low creep strength under high temperatures. At room temperature, platinum does not break until 150MPa of stress is applied, but it will break by an extremely small stress of 2MPa at 1,400°C in 100 hours. The twin bore aluminum insulation tubes generally used in the assembly

of thermocouples weigh more than 4 grams with a diameter of 4mm and a length of 100mm, and if ten such insulation tubes are directly placed on a 0.5mm-diameter platinum wire, the stress applied to the wire exceeds 2MPa, resulting in breakage within 100 hours. Therefore, users take steps to reduce breakages such as increasing the diameter of the thermocouple and/or installing multiple thermocouples, but this presents issues such as poor operating efficiency and heightened cost.

### ■ World's first thermocouple utilizing reinforced platinum

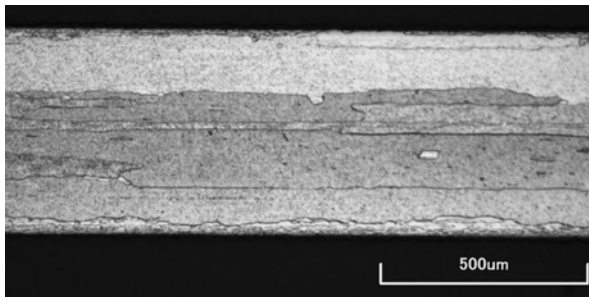
The developed type R thermocouple wire developed here is the world's first to utilize oxide dispersion strengthened (ODS) platinum on the negative electrode, and succeeded in increasing the high-temperature creep strength of the negative electrode by ten times compared to conventional wire. This ODS platinum is produced by dispersing oxidized zirconium over a platinum base (base structure). Acceptable accuracy of temperature measurement has been rated as "Class 1," which is the highest precision (least tolerance) under the standards of the International Electrotechnical Commission (IEC), providing almost same thermoelectromotive force characteristic as pure platinum currently used on the negative electrode.

Samples can be provided in lengths of up to 3 meters, and manufacturing facilities and material development will be strengthened to meet the needs of customers in the future.

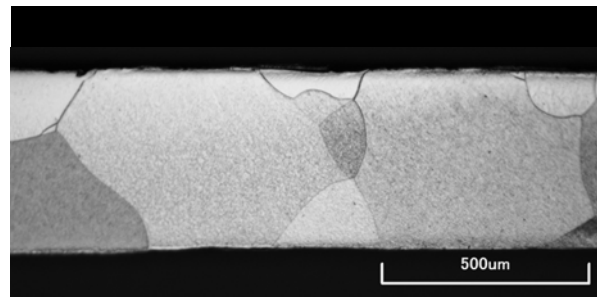
#### \* Creep strength:

The stress when a designated creep occurs within a certain period. Creep is a phenomenon in which a material is deformed over time when a fixed amount of stress is applied under a constant temperature.

#### <Reference> Comparison of Cross-sectional Microstructure of Thermocouple Wire



Successfully developed thermocouple wire using ODS platinum



Conventional used thermocouple wire using high purity platinum

The microstructure of ODS platinum is completely different from the microstructure of high purity platinum that is commonly used now, and depicts the crystal granules are highly elongated in the drawing direction of the wire. This structure provides high creep strength under usage temperature of 1,400°C.

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

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

Representative: Hideya Okamoto, President & CEO

Founded: 1885

Incorporated: 1918

Capital: 500 million yen

Employees in consolidated group: 3,869 (FY2011)

Net sales of consolidated group: 1.064 trillion yen (FY2011)

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 Kikinzoku Kogyo K.K.**

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

Representative: Hideya Okamoto, President & CEO

Founded: 1885

Incorporated: 1918

Capital: 500 million yen

Employees: 1,663 (FY2011)

Sales: 1.036 trillion yen (FY2011)

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.