

April 6, 2012

Tanaka Precious Metals  
Tanaka Holdings Co., Ltd.

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## **Tanaka Precious Metals Succeeds in Development of World's First Platinum Electrode Able to Produce Ozone Solution at 40 Times Existing Efficiency**

Sample provision has begun aiming for mass production during 2013 – Can be implemented in sterilization and deodorizing applications in a wide range of areas spanning from electrical appliances, motor vehicles, medical facilities and food to wastewater treatment

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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: President Hideya Okamoto), which operates the Tanaka Precious Metals' manufacturing business, had successfully developed a platinum electrode able to produce ozone solution widely used in applications such as sterilization and deodorizing at 40 times the efficiency of existing technology.

The newly-developed electrode is a platinum electrode can produce ozone at high efficiency through the electrolysis of water, and is able to produce 3.6ppm (parts per million) of ozone by performing electrolysis of water for 30 minutes under the low-current conditions of 0.1 amperes per square centimeter. Although conventional platinum electrodes faced the problem of low production efficiency because they produce 0.09ppm of ozone under the same conditions, by having to create a new platinum-based catalyst layer has enabled the realization of high production efficiency at 40 times existing levels in a world first.

As power consumption can be reduced by using these newly-developed electrodes as replacements in applications such as sterile water and rinse water currently utilizing electrolysis-based ozone production (electrolytic process), running costs are expected to be reduced to less than 1/10 of the current level. Furthermore, in applications such as wastewater treatment and semiconductor cleaning, a variety of production methods such as the electrical discharge method and the photochemical reaction method are used according to the requirements. By utilizing its high production efficiency, the production method using the newly-developed electrode is expected to replace a variety of ozone production methods on a practical level without lowering production efficiency.



The newly-developed ozone production electrode

The newly-developed electrode is an electrode incorporating a new catalyst layer made up of an alloy of titanium and platinum. When used as an anode, the electrode can increase the electric potential for producing oxygen through the electrolysis of water (higher oxygen overvoltage), and is able to efficiently produce cathode reactions that conflict with oxygen production reactions normally difficult to produce with ordinary electrodes. Titanium has a high oxygen overvoltage but an extremely short lifespan, and although platinum is characterized by having a long lifespan but with a low oxygen overvoltage. By making an alloy of titanium and platinum, which have opposite characteristics under optimal conditions, to create a new electrode catalyst boasting the strengths of both materials, Tanaka Kikinokogyo has successfully developed an electrode combining high oxygen overvoltage and a long lifespan<sup>(\*)</sup>, which has not been possible until now.

### ■ Issues in existing technology

Production of ozone through electrolysis for industrial purposes mainly utilizes electrodes made of a coating of oxidized lead on a base of valve metal or pure platinum electrodes. However, electrodes coated with lead oxide suffer problems such as reduced electrode life due to separation during electrolysis and the elution of lead, which is a harmful substance. Meanwhile, cost is an obstacle for pure platinum electrodes due to their low ozone production efficiency and the high cost of materials. Furthermore, titanium electrodes coated with platinum have been developed, and although these do not suffer the same environmental problems as lead oxide or the same issues with economy as pure platinum, they face the issue of being unable to achieve sufficient ozone production efficiency or electrode lifespan.

In addition, another typical ozone production method that is used in wastewater treatment and semiconductor manufacturing processes is the electrical discharge method (including the silent discharge and the corona discharge method). A feature of this method is its ability to produce large amounts of ozone, but obstacles include the need for large devices and the production of nitrogen oxide contaminants unless oxygen is used as a raw material.

### ■ Ozone solution can be implemented in any usage scenario

Ozone solution is a highly oxidative substance capable of sterilization, deodorizing, deactivation of viruses and removal of organic material. As it naturally breaks down into oxygen at room temperature, it is safe compared to oxidants such as hypochlorous acid, and due to this characteristic, it is used in familiar roles such as sterilization and deodorizing in electrical appliances, motor vehicles and medical facilities, in addition to a wide range of applications such as wastewater treatment and cleaning in the semiconductor manufacturing process. (See Figure 1 for the areas in which ozone solution is used)

The platinum electrode Tanaka Kikinokogyo successfully developed can be used as a production electrode on a practical level in various applications of ozone solution, and can

also be used as an alternative for current technology where ozone solution is not presently used. The main features of the electrode are as follows.

- 40 times the ozone production efficiency of existing platinum electrodes
- Expected to reduce running costs to less than 1/10 because ozone can be produced at lower energy conditions than conventional platinum electrodes.
- Secondary nitrogen oxides are not produced because ozone is produced from water
- Can be safely used in food and medical applications because harmful substances such as lead are not contained
- Production is possible using a relatively small production devices

Tanaka Kikinzoku Kogyo will continue to make technological improvements to increase the lifespan and stabilize the quality of the electrode while providing samples with the aim of starting mass production in 2013.

**Figure 1. Examples of Areas Using Ozone Solution**

Low-volume Use	
Deodorizing:	Medical facilities, motor vehicles and trains, hotels, resident space (electrical appliances such as refrigerators), etc.
Sterilization:	Medical facilities, food and food factories, agriculture, hand washing in the ordinary family, etc.
Air purification:	Medical facilities, motor vehicles, living space, etc.
Cleaning:	Public toilets, carwash, floors (buildings, etc.)
High-volume Use	
Wastewater treatment:	Water supply and sewage, industrial wastewater, landfill leachate, etc.
Cleaning:	Semiconductor manufacturing process, food containers such as PET bottles and plastic, etc.
Electrolytic synthesis:	Electrolytic synthesis of peroxides, etc.

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(\*1) As a result of the current durability test performed by the Company, it was found to have a lifespan of over 1,000 hours under a current of 0.1A/cm<sup>2</sup> (over 100Ah/cm<sup>2</sup>).

■**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: 3,456 (FY2010)

Net sales of consolidated group: 891.0 billion yen (FY2010)

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: 1,532 (FY2010)

Sales: 865.4 billion yen (FY2010)

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.