

September 30, 2014

Tanaka Precious Metals  
Tanaka Holdings Co., Ltd.  
Kuraray Chemical Co., Ltd.

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## TANAKA and Kuraray Chemical to Jointly Develop Activated Carbon Filters Enabling Recovery of Upwards of 99.8% of Palladium Contained in Plating Rinse Wastewater, and Commence Leasing in September

Rinse wastewater generated in plastic plating of automotive and electronic components can be used  
as a resource with no initial investment

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Tanaka Kikinzoku Kogyo K.K.<sup>(\*)1</sup> (Head office: Marunouchi, Chiyoda-ku, Tokyo; President & CEO: Akira Tanae) and Kuraray Chemical Co., Ltd. (Head office: Osaka-shi, Osaka; President & CEO: Yasuhiro Yamamoto) today announced that they will jointly develop the ACF401 activated carbon filter able to recover low-concentration palladium contained in plating rinse wastewater at a high efficiency of upwards of 99.8%, and commenced leasing these with filter housings in September, 2014. Manufacturers using plastic plating are able to recover palladium by installing the filter housing in palladium catalyst rinse tanks and maintaining specific conditions<sup>(\*)2</sup>. Doing so will enable revenue to be obtained from where there was previously no profit without any initial investment by utilizing the palladium that had been discarded as waste in the past at low cost with high efficiency.

When applying metal plating (copper, nickel, chromium, etc.) to a nonconductive surface such as plastic or glass, it is necessary to add a palladium catalyst to form the precipitation core of electroless plating aimed at making these conductive. Palladium catalyst solution is used in a wide range of areas including plastic items used as automotive components, electrical appliances, construction, toys, and recreational and leisure goods, in addition to copper plating through holes and via holes on printed circuit boards. Components applied with catalyst in a palladium catalyst bath are washed in water to rinse off any excess palladium catalyst, and the wastewater used for washing contains low concentrations<sup>(\*)3</sup> of palladium. When using existing technology, palladium was discarded without being recovered from wastewater due to low adsorption capacity of precious metals and difficulty in dealing with the liquid properties of the catalyst solution.

### ■ Features of the ACF401

The ACF401 is an activated carbon filter which is able to recover low-concentration palladium contained in plating rinse wastewater at a high efficiency of upwards of 99.8%. Tanaka Kikinzoku Kogyo will lease ACF401 filters and filter housings to users, and when collecting filters, pay users the difference between the price of palladium recovered and costs (filter fees and recovery and refinement fees). The applicable catalyst waste solutions are hydrochloric acid-based palladium-tin catalyst waste solutions and alkali catalyst waste solutions; it is possible to recover not only rinse wastewater but also the renewal wastewater in catalyst baths.



Appearance of the ACF401

The ACF401 is available in three sizes – 10 inches (250 millimeters), 20 inches (500 millimeters) and 30 inches (750 millimeters) – according to the size of the rinse bath and the amount of palladium being recovered. Approximately 25 grams of palladium can be adsorbed by each 10-inch filter, 50 grams by each 20-inch filter and 75 grams by each 30-inch filter. For example, if 400 grams of palladium is recovered, the user receives approximately 960,000 yen<sup>(\*)</sup>.

## ■ Issues in Conventional Recovery Technology

The use of ion exchange resin and activated carbon are known as methods for recovering precious metals from wastewater containing low concentration of precious metals such as palladium, but the low rate of adsorption of precious metals was an issue for some types of solution such as those with high concentration of acid, alkali, salt, or impurities.

Adding a special functional group to use resin to selectively adsorb precious metals is known as another method, but in addition to the high manufacturing cost and recovery cost, it is necessary to repeat the adsorption and elution/recycling processes, and it was difficult to sufficiently control the reduction in the adsorption rate and elution rate caused by repeated use.

Another method that has been considered is the addition of a flocculent to rinse wastewater after palladium catalyst treatment to settle out slurry containing palladium, and then dissolving the settled slurry containing palladium with inorganic acid (hydrochloric acid, sulfuric acid, etc.), adsorbing palladium to activated carbon by passing the solution through a column (separation tube) of capture material (activated carbon) holding a reducing agent. This method enables palladium to be recovered relatively easily, but it not only costs a lot, but also had insufficient ability to adsorb palladium.

To resolve the issues presented by these conventional recovery technologies, Tanaka Kikinzoku Kogyo and Kuraray Chemical jointly developed the ACF401. The ACF401 was jointly developed by explaining the adsorption mechanism based on Tanaka Kikinzoku Kogyo's knowledge on precious metals and Kuraray Chemical's knowledge on activated carbon. Tanaka Precious Metals has also created a palladium recovery business using the ACF401. To recover palladium, Kuraray Chemical will manufacture the ACF401, and Tanaka Kikinzoku Kogyo will lease the ACF401 units with filter housings to recover the palladium.

In addition, Tanaka Kikinzoku Kogyo has commercially developed the ACF401-CP capsule filter containing a ACF401 and a housing (the cover for the capsule) giving consideration to ease of removal primarily for overseas markets. Because there are regulations on the export of precious metals from China, the company will work with Atotech (China) Chemicals Ltd., which is headquartered in Guangzhou and in operates in areas such as Nanjing and Shanghai, to provide the same level of services as in Japan.

Tanaka Kikinzoku Kogyo aims to achieve annual sales of approximately JPY2 billion by leasing ACF401 units to customers such as plastic plating manufacturers and printed circuit board manufacturers.

\*1 Tanaka Kikinzoku Kogyo K.K.

The core company conducting manufacturing operations in the Tanaka Precious Metals Group, which has Tanaka Holdings Co., Ltd. as its holding company

\*2 In the palladium-tin catalytic process, it is necessary to perform circulation recovery and use the rinse bath as a holding bath to control concentration of acid.

\*3 Low concentration

In this case, low concentration means that the concentration of palladium is less than 5 milligrams per liter.

\*4 Calculated based on a palladium price of approximately 3,000 yen per gram (reference price as of September, 2014).



Filter housing containing the ACF401

■**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: 3,562 (FY2013)

Net sales of consolidated group: 967.6 billion yen (FY2013)

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: 1,430 (FY2013)

Sales: 929 billion 60 million yen (FY2013)

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.

■**Kuraray Chemical Co., Ltd.**

Headquarters: 39F Umeda Hankyu Building Office Tower, 8-1, Kakudacho, Kita-ku, Osaka-shi, Osaka

Representative: Yasuhiro Yamamoto, President and CEO

Established: 1940 Capital: 600 million yen (100% subsidiary of Kuraray Co., Ltd.)

Employees: 331 (FY2013) Sales: 17.8 billion yen (FY2013)

Main businesses: Manufacture and sale of activated carbon and other chemicals

Website: <http://www.kuraray-c.co.jp/>