

24 Nov. 2010
Tokyo Electron Limited
Tanaka Holdings Co., Ltd.
Tanaka Precious Metals

**TOKYO ELECTRON and TANAKA KIKINZOKU KOGYO succeeded
the Joint Development of Innovative Recycling Process of Ruthenium Precursors.**

-Enabling the Reuse of Ruthenium Precursors Normally Discarded-

Tokyo Electron Limited (head office: Akasaka, Minato-ku, Tokyo; President & CEO: Hiroshi Takenaka) and Tanaka Kikinzoku Kogyo K.K. ^{※1} (head office: Marunouchi, Chiyoda-ku, Tokyo; President & CEO: Hideya Okamoto) announce the successful completion of the joint development to create a recycling process of the ruthenium precursors(CVD-ruthenium material) used in the next generation semiconductors miniaturization technology.

As a result, the ruthenium precursors which were disposed without being collected as valuable resources in the past, can now be collected, refined, and re-used without returning to ruthenium metal. Upon this joint development, Tokyo Electron Limited developed the recover system which collect the residue in ruthenium-CVD precursor that did not deposit onto wafer, and Tanaka Kikinzoku Kogyo K.K. developed the process to refine and re-use the collected ruthenium precursors.

In semiconductor fabrication, there are many challenges for scaling, such as improving the copper filling performance in narrow interconnect. Tokyo Electron has proposed an improvement in copper filling performance by utilizing a ruthenium liner film with excellent adhesion and lower resistivity.

With the goal of lowering overall cost and ensuring a stable supply of ruthenium precursors, Tokyo Electron and Tanaka Kikinzoku Kogyo agreed to jointly develop a recycling process. This recycling process will save almost 20% of the ruthenium precursors cost and significantly lower the CoC^{※2} of CVD-ruthenium process. In the semiconductor industry with inevitable reduction in costs, it is expected to the total cost decreased, and to become a implementation of the new technology introduction. Furthermore, almost 30% reduction of CO₂ emission is also expected by utilizing this new recycling process.

■About Ruthenium

Ruthenium is produced primarily in South Africa and is found in platinum ore in amounts of about 10-20%. The annual output of ruthenium worldwide is approximately 30 tons. It is estimated that ruthenium reserve quantities are nearly 6,000 tons.

Tanaka Kikinzoku Kogyo is engaged in business with the mining company Anglo Platinum Inc., which has over 40 percent of world market share in the PGM^{※3} metals.

Atomic Number	: 44	Chemical stability:
Melting Point	: 2,250 °C	- No dissolution in the plating bath.
Resistivity	: 7.6 $\mu \Omega$ cm	- Neither diffusion nor the alloy are in Cu.
	- Ru Oxide is electroconductive.	
Lattice parameter	: Ru(002) 2.14 Å	
	- near Cu , Cu(111) 2.09 Å	

<The Term Explanation>

※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 CoC :

Cost of Consumable

※3 PGM (Platinum Group Metals) :

Platinum, Palladium, Rhodium, Iridium, Ruthenium, Osmium

■Tokyo Electron Limited

Head quarters: Akasaka Biz Tower 5-3-1 Akasaka, Minato-ku, Tokyo, Japan

Established: 1963

Capital: 54,961 millions of yen (as of April 1, 2010)

Consolidated net sales: 418 billions of yen (FY 2009)

Number of employees: 1,127 (as of October 1, 2010)

Representative Director, President: Hiroshi Takenaka

Activities:

Semiconductor Production Equipment, Flat Panel Display Production Equipment, Photovoltaic Production Equipment, Electronic Components and Computer Networks

Website: <http://www.tel.co.jp>

■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: 3441 (FY2009)

Net sales of consolidated group: 710.2 billion yen (FY2009)

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>

■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: 1,599 (as of March 2010)

Sales: 388.8 billion yen (as of the financial closing at the end of March 2010)

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>

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 Kogyo K.K.
- Tanaka Kikinzoku Hanbai K.K.
- Tanaka Kikinzoku International K.K.
- Tanaka Denshi Kogyo K.K.
- Electroplating Engineers of Japan, Limited
- Tanaka Kikinzoku Jewelry K.K.
- Tanaka Kikinzoku Business Service K.K.