

Tanaka Kikinzoku Kogyo K.K. (TKK)

5th, Feb 2018

TANAKA America, Inc

Medical Device Components

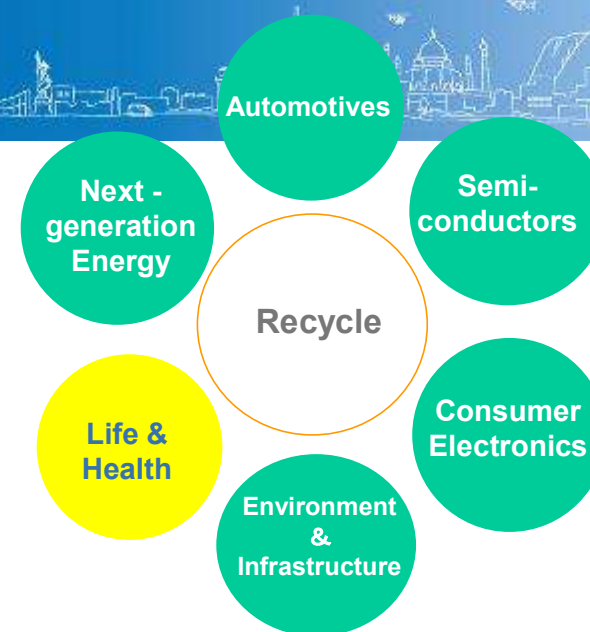
Phone:408-778-3217

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











TANAKA Group at a glance

| | |
|---------------------|---|
| Founded | 1885 |
| Sales revenue | 9.67 billion US\$ (2016) |
| Profit | 42 Million US\$ (2015) |
| Number of Employees | 5,120 (2016) |
| Headquarter | Tokyo, Japan |
| Business | Precious metal components manufacturing |



8 metals

| | | | |
|---|---|---|---|
| 44 Ruthenium (Ru) | 45 Rhodium (Rh) | 46 Palladium (Pd) | 47 Silver (Ag) |
|  |  |  |  |
| 76 Osmium (Os) | 77 Iridium (Ir) | 78 Platinum (Pt) | 79 Gold (Au) |
|  |  |  |  |

TANAKA Group Companies

The TANAKA KIKINZOKU GROUP is supported by five core companies.
Each of these companies is a professional in its own field, meeting the requests of customers and collaborating group-wide to bring out TANAKA's unique ability to provide solutions.



TANAKA HOLDINGS Co., Ltd.

Strategic and efficient group management and management group companies as the holding company at the center of the TANAKA KIKINZOKU GROUP.

TANAKA KIKINZOKU KOGYO K.K.

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

TANAKA DENSHI KOGYO K.K.

Manufacturing of various bonding wires, and provision of technical services globally.

ELECTROPLATING ENGINEERS OF JAPAN Ltd.

Development, manufacture, sales and export of precious metal and base metal plating solutions, additives and surface treatment-related chemicals, and wafer plating equipment.

TANAKA KIKINZOKU JEWELRY K.K.

Retailing of gold and platinum jewelry, import jewelry, bridal jewelry, precious metals art objects and various commemorative gifts.
Remodeling, repair and recycling used jewelry (RE:TANAKA) . Selling and buying of gold and platinum bullion bars and coins.

Our Global Network



With subsidiaries and factories all over the world, the TANAKA has a truly global presence.



- Branch, sales office, or overseas affiliated company
- Plant
- Headquarters

Precious Metal Electrode for Medical Device

Precious metals are used for diagnostic/therapeutic medical device electrode, because their precious properties as below.

However, researcher for medical device electrode are still challenging to retrieve better electric signal from human body and to improve economical cost.

The one of key challenge is **miniaturization of electrode**.

Precious metal features:

- ✓ Electro conductivity
- ✓ Biocompatibility
- ✓ Mechanical properties
- ✓ Fatigue strength
- ✓ Corrosion resistance
- ✓ Radio-opacity

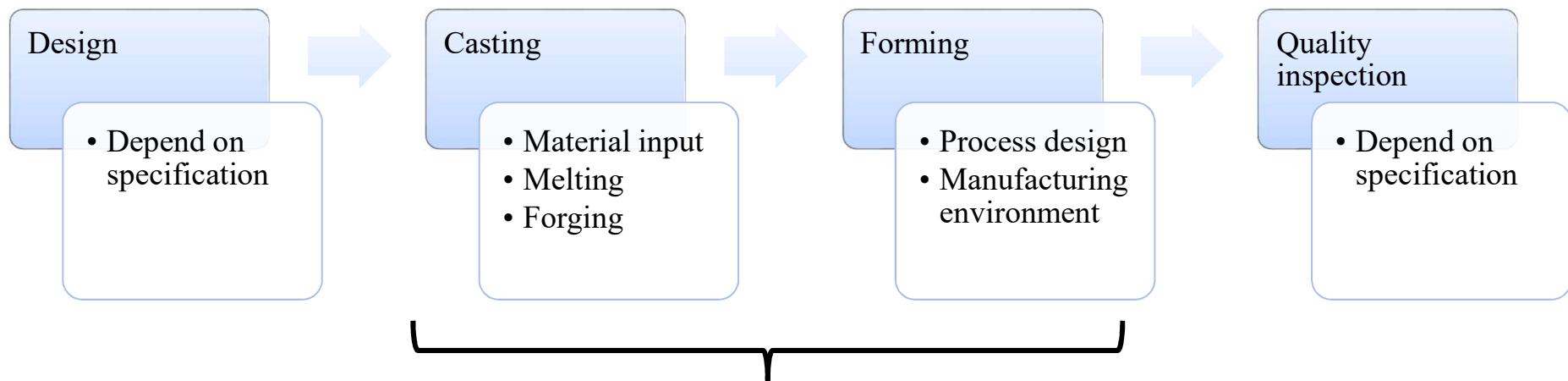
Application:

- ✓ Pace makers
- ✓ Defibrillator
- ✓ Cochlear implant
- ✓ Neuro stimulation devices
- ✓ Ablation catheter
- ✓ Mapping catheter

Miniaturization of electrode: Why and how?

Miniaturization of electrode shows several advantage as following,
(1) Minimize invasiveness, (2) Improve efficiency/energy consumption, and
(3) Reduce material cost, but **challenge is difficulty of realization.**

Manufacturing process for electrode components

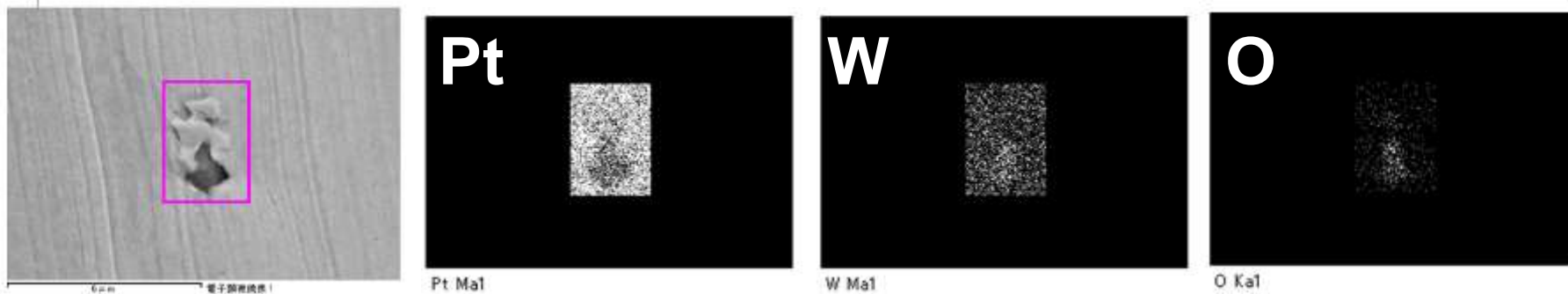


Not only forming process, casting also important for manufacturing miniaturized electrode components.

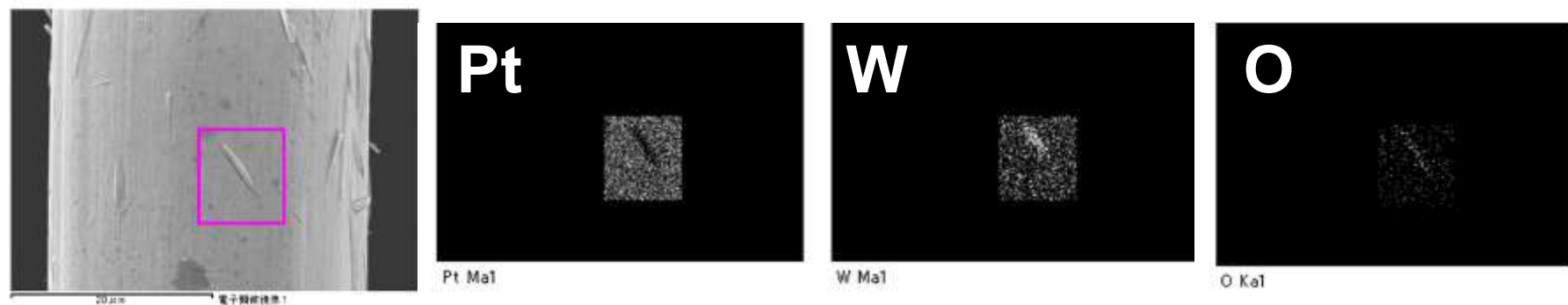
Raw material selection: What's the issue?

For miniaturized process, small portion of inclusion in alloy makes more difficult for manufacturing process, because it makes crack in alloy easily. Inclusions in Pt-8W are shown as below by SEM-EDX observation.

Inclusions (supposed to from raw material input)



Inclusions (supposed to from melting process)

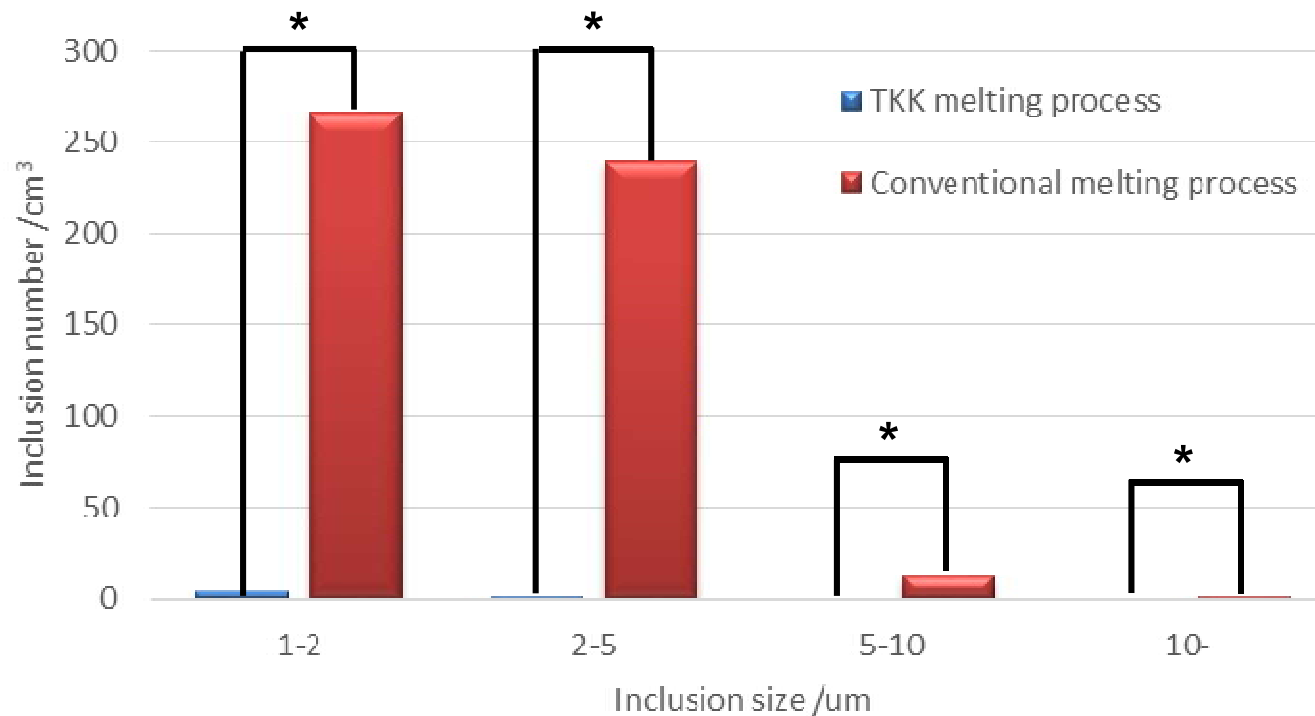


Raw material selection: How TKK overcome it?

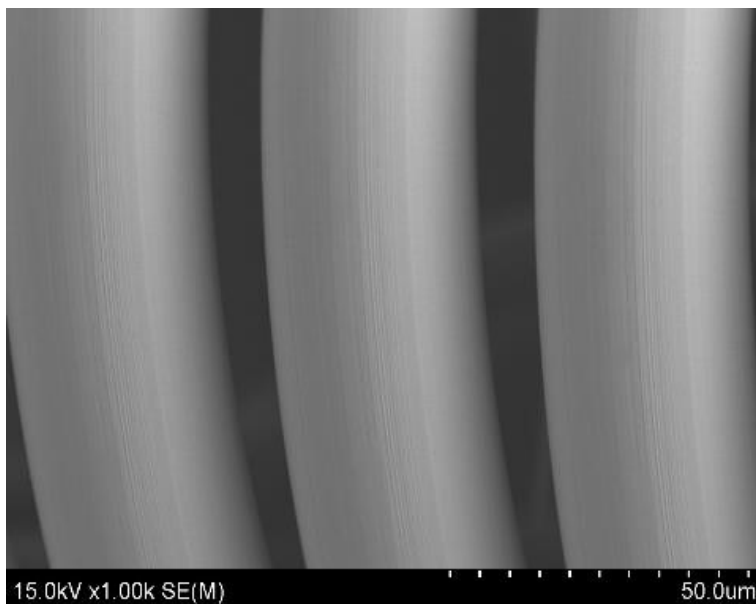
TKK can use pure raw materials from our own refining system.
Also, we developed new melting process for reducing the inclusions from crucible.

Material: Pd (99.9%)

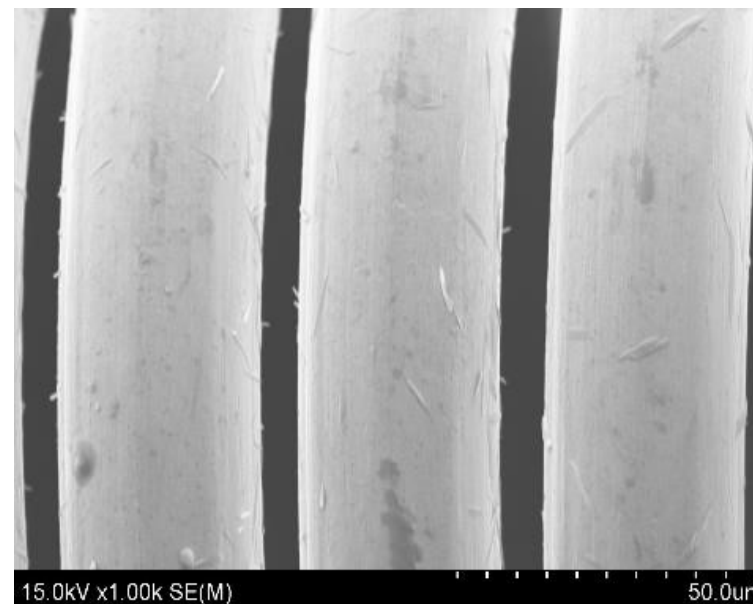
Inclusion measurement: 100nm membrane filter counting



Comparison of Pt-8W wire ($\phi 0.00125''/32\mu\text{m}$)



Specialized by TKK



Conventional

TKK shows specialized casting process for miniaturized electrode. Our process significantly reduce inclusions from raw material and melting process. It apply for not only wire forming, but also ring/tubing, sheet and micromachining components.

Ring electrode

TKK also develop the ring forming process of both smaller outer diameter and thinner wall ring electrode.

Optical microscopic image, Pt-10Ir ring

Different outer diameter with different wall thickness



Fluoroscopic image, Pt-10Ir ring

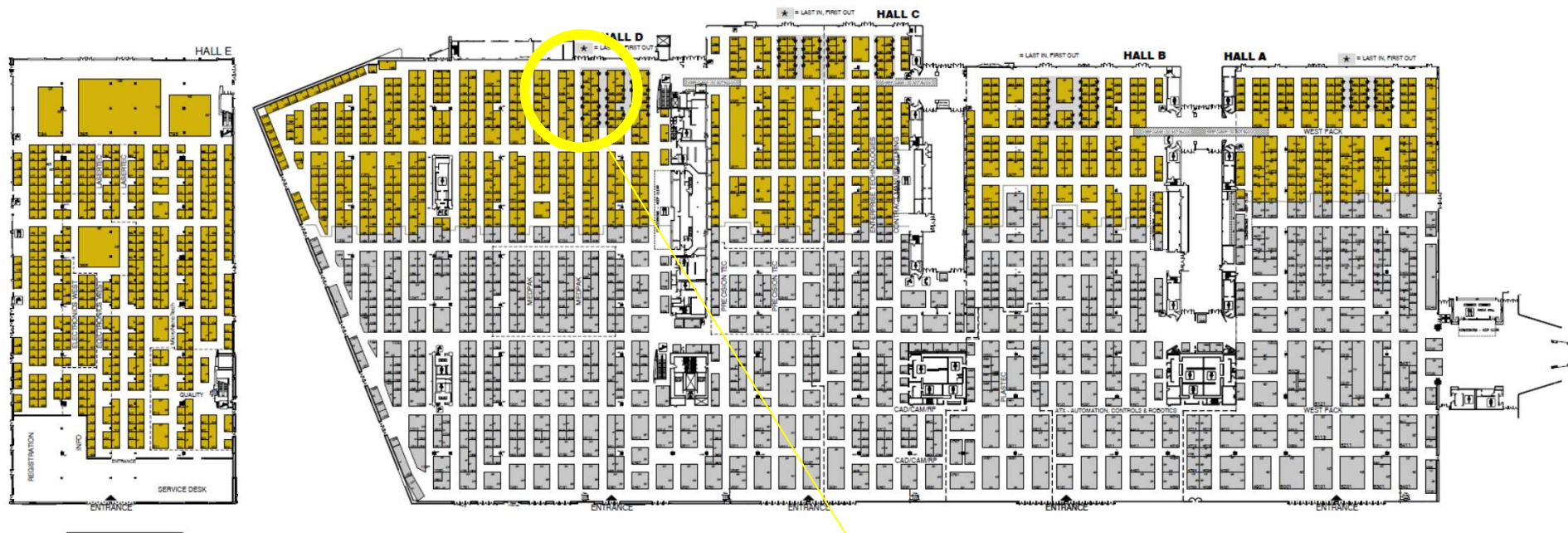
OD=1.5mm, L=1.0mm, Wall = 70µm, 50µm, 30µm)



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