Introduction of PARTICLE GETTER
Introduction of PARTICLE GETTER

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PARTICLE GETTER

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Company Information

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Company name     Sunric Co., Ltd.
Representative    Takashi Yoshioka (President)
Capital           20 million yen
Established on    November 18, 1968
Founded in        May 1942

Location          Head Office/Plant
                  2-13-45 Fukuura, Kanazawa-ku, Yokohama, Kanagawa 236-0004
                  Tel: 045-522-8988  Fax: 045-522-8992

Employees        115 (as of Sep 2017)

Certified No. JQA-QM4321 Obtained February 2000
Certified No. JQA-EM5723 Obtained March 2007
Line of business

Introduction of PARTİCLE GETTER

Vacuum evaporation parts for equipment
- Laser disk manufacturing equipment
- Reflector manufacturing equipment
- Lens manufacturing equipment
- Crystal oscillator manufacturing equipment
- TIN(thin film) carbide tool manufacturing equipment
- Other equipments

Semiconductor equipment parts for equipment
- Ion implantation equipment
- Sputtering equipment
- MBE equipment
- Other equipments
- MOCVD equipment (including LED)
- Cluster ion beam equipment

Vacuum high-temperature heat-treated parts for equipment
- HIP furnace
- Vacuum brazing furnace
- Vacuum ceramic baking furnace
- Tantalum capacitor baking furnace
- Sapphire growth furnace
- Other furnaces

Special machined parts for equipment
- Ion implantation equipment
- HIP furnace
- Vacuum brazing furnace
- Vacuum ceramic baking furnace
- Other furnaces
- Sunic manufactures precision parts for various types of equipment and facilities using hard metals difficult to process that have been drawn or otherwise processed

Sputtering targets / shields
- LCD display manufacturing equipment
- Semiconductor manufacturing equipment
- Compact disk manufacturing equipment
- Solar panel manufacturing equipment
- Magneto-optical disk manufacturing equipment

Sale of materials [bars, plates, blocks and wires]
- Tungsten
- Stainless steel
- Molybdenum
- Chromium
- Tantalum
- Inconel
- Titanium
- High purity aluminum
- Nickel
- Copper
- Niobium
What is Particle Getter?

Introduction of PARTICLE GETTER

Particle Getter (PG) is a copper film, whose surface is specially processed, to be used as an alternative to AL spray in conventional spraying process.

The following effects have been demonstrated by putting the PG on the surface of the parts inside the equipment used for film formation.

1. Particle control (Adsorption of the particles by special surface processing)

2. Controlling of the detachment of the films from the surface of the parts inside the equipment (reducing the residual stress of the attached films by embossment)

Material: Copper film (99.9% or more)
Na ≤ 0.1ppm, K ≤ 0.1ppm, U ≤ 0.001ppm, Th ≤ 0.001ppm

Surface processing: flat, embossment
Thickness: 210 μm, 140 μm, 70 μm
Effects of PG

Introduction of PARTICLE GETTER

Target life

- Reducing the detachment of the adsorbed film from the part surface
- Present condition of the particle during spattering
  - Improving the yields

- Reducing the frequency of replacement of the parts because of reduced particles
- Reducing the downtime of the equipment
  - Stabilizing the production schedule, etc.

- Reducing the wear of the parts, because film removal with chemicals is not performed
- Longer life of the parts
  - Reducing the costs

Without PG

PG installed

- Parts replacement
- Downtime
- Target exchange

Number of particles
Characteristics of PG: Anchoring Effects

Schematic diagram of the effects of anchoring

Strong adhesion on the PG/adsorbed film interface

Unique surface condition after PG/adsorption (SEM)

Cross-section view of PG/adsorbed film
Characteristics of PG: Mitigation of the adsorbed film stress (1)

When the adsorbed film becomes thicker, the PG gets deformed between welding points, and thus, the stress in the adsorbed film is mitigated.

The PG and the part are joined only at the welding points.
Characteristics of PG: Mitigation of the adsorbed film stress (2)

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PG installed: before forming the film

PG installed: after forming the film
Comparison of PG and AL spray (1)

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Accumulated energy (kWh)

Target life (kWh)

Particles (0.3 μm>d)

AL Spray

Particle Getter

Data from MRC Eclipse, Ti/TiN process (> 0.3 μ)
Comparison of PG and AL spray (2)

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**SEM**

adsorbed film: W-Ti

**AL Spray**

Surface of the sprayed aluminum part

**Particle Getter**

Surface of the aluminum part after PG processing
Example of the usage of PG: Bending

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Example of the usage of PG: Wire clamping
Example of the usage of PG: Screw clamping
Example of the usage of PG: PG die cutting
Example of the usage of PG

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Example of the usage of PG

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Using the PG: How to choose the optimal PG?

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Points to be taken into consideration while choosing PG

- ✔️ Material to adsorb
- ✔️ With or without clearance
- ✔️ Thickness of the adsorbed film

It is necessary to choose the optimal type after actually installing it.

70 μ embossed PG 0.22 mm
140 μ softening, embossed PG 0.57 mm
210 μ flat PG 0.22 mm
210 μ embossed PG 0.85 mm
Major industries using PG, and examples of target materials

<table>
<thead>
<tr>
<th>Semiconductor</th>
<th>Liquid crystal</th>
<th>HDD</th>
<th>Crystal resonator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag</td>
<td>SiO2</td>
<td>Ru</td>
<td>SiO</td>
</tr>
<tr>
<td>Au</td>
<td>ITO</td>
<td>CoCrPtTaBr</td>
<td>Tio</td>
</tr>
<tr>
<td>Pt</td>
<td>TiO2</td>
<td>Cr</td>
<td>Tantalum pentoxide</td>
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<tr>
<td>W-Ti</td>
<td>Ti</td>
<td>DLC</td>
<td>MoF2</td>
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<td></td>
</tr>
<tr>
<td>Mo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MoSi</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Customer feedback**

Introduction of PARTICLE GETTER

**Merit of PG(examples)**

- "Yield rate of semiconductor products improved."
- "PG reforms better than previous situation that much dusts in bias sputtering prevents process."
- "Parts life extends because blast processing to shield decreases."
- "Retrieval rate of rare metal was improved as new merit."

**Examples of PG installed equipment**

<table>
<thead>
<tr>
<th>Maker / Model name</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNVAC / Ceraus</td>
<td>4500 4800 9000</td>
</tr>
<tr>
<td>Anelva / ILC</td>
<td>1051 1060 —</td>
</tr>
<tr>
<td>Varian</td>
<td>3180 3290 —</td>
</tr>
<tr>
<td>Applied Materials / ENDUR</td>
<td>5500</td>
</tr>
</tbody>
</table>
PG process steps

1. PG detachment
2. Blast treatment
3. Cleaning (purewater cleaning)
4. Drying
5. PG installation
6. Vacuum packing
7. Shipping
8. Delivery
Particle Getter process steps and logistics flow

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When the PG is installed at Sunric

Customer ➔ Parts ➔ Sunric ➔ Detachment ➔ Blast ➔ Purewater Cleaning ➔ Vacuum packing ➔ Installation ➔ Drying

When the PG installed by customer

Customer ➔ Parts ➔ PG adsorption ➔ Using of parts ➔ PG detachment ➔ Drying ➔ Cleaning ➔ Sunric ➔ PG cutting ➔ Vacuum packing
Effects of the PG on the ITO film formation

Introduction of PARTICLE GETTER

Surface after sputtering is competed

Without PG

PG installed

Erosion surface

Significant reduction of nodule identified by the use of PG

Reduced particles in the film formation due to PG

Target: ITO UHD-X grade
Power density: 1.0W / cm²
Total Power Supply: 40whr / cm²
Part after installing the PG

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Part after film formation (ITO, MO)