Giving every grain a purpose

# Platinum Products For Glass Industry

SAFINA


HOMOGENIZERS

OUTFLOW DEVICES

STIRRERS

BUSHINGS

TUBES AND THIMBLES

PLATINUM COATINGS

GRAIN-STABILIZED PLATINUM (GSP)

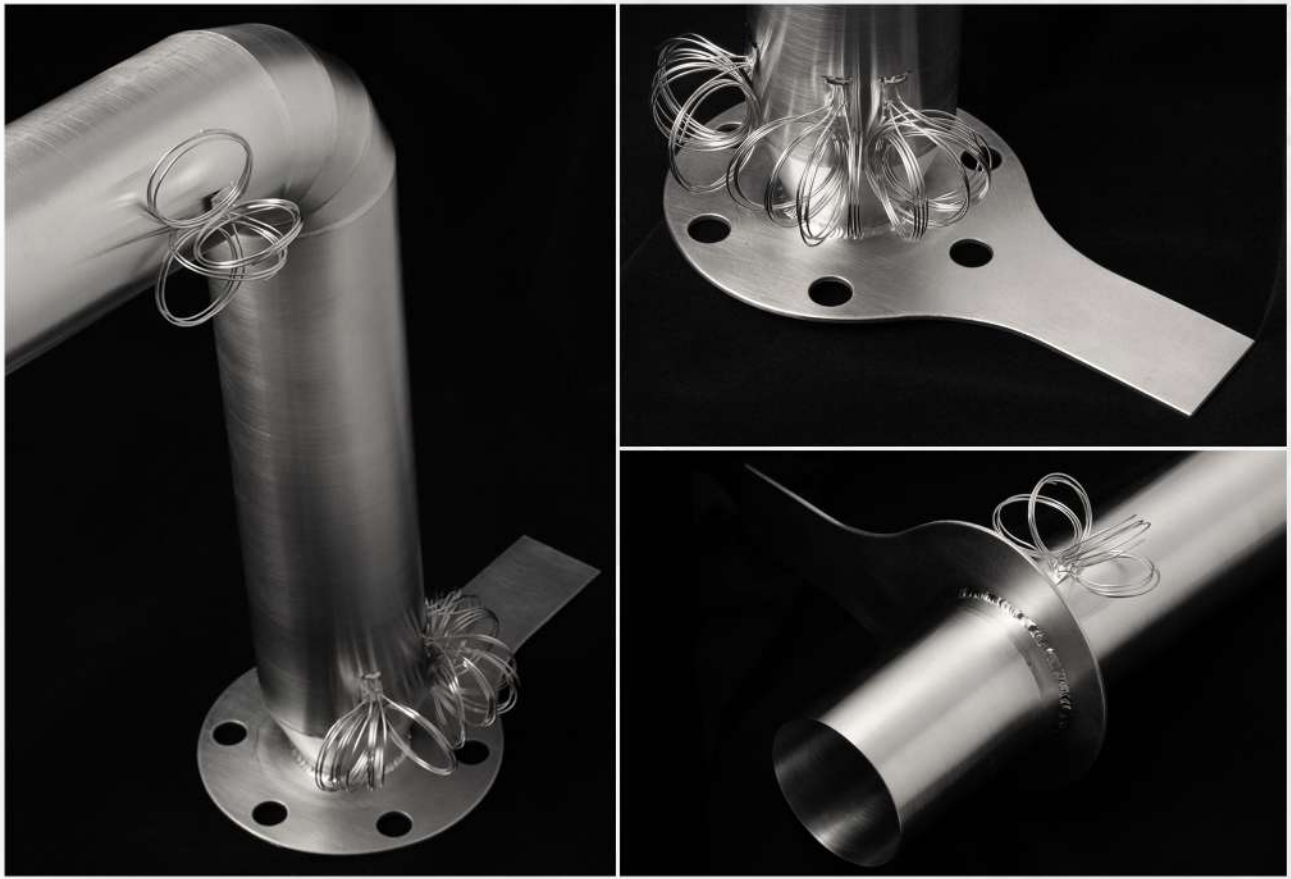
THERMOCOUPLE WIRES

LABORATORY EQUIPMENT

RECYCLING

## Homogenizers

Homogenizers are used for the final treatment of molten glass before it enters the feeder. Density and homogeneity are adjusted here before the molten glass is actually used in the production line.



**Materials:**

- Pt 99,95/99,99%
- PtRh10/20/30
- PtPd10/20/30
- PtIr5/10/20/25
- PtAu5/10
- Pt GSP
- Ir 99,95%
- or on request

## Outflow Devices

Outflow devices serve as dispensers for the amount of molten glass that enters the production line. For each product, a specific dosing device is used according to its size and the amount of molten glass for its production.

**Materials:**

- Pt 99,95/99,99%
- PtRh10/20/30
- PtPd10/20/30
- PtIr5/10/20/25
- PtAu5/10
- Pt GSP
- Ir 99,95%
- or on request

## Stirrers

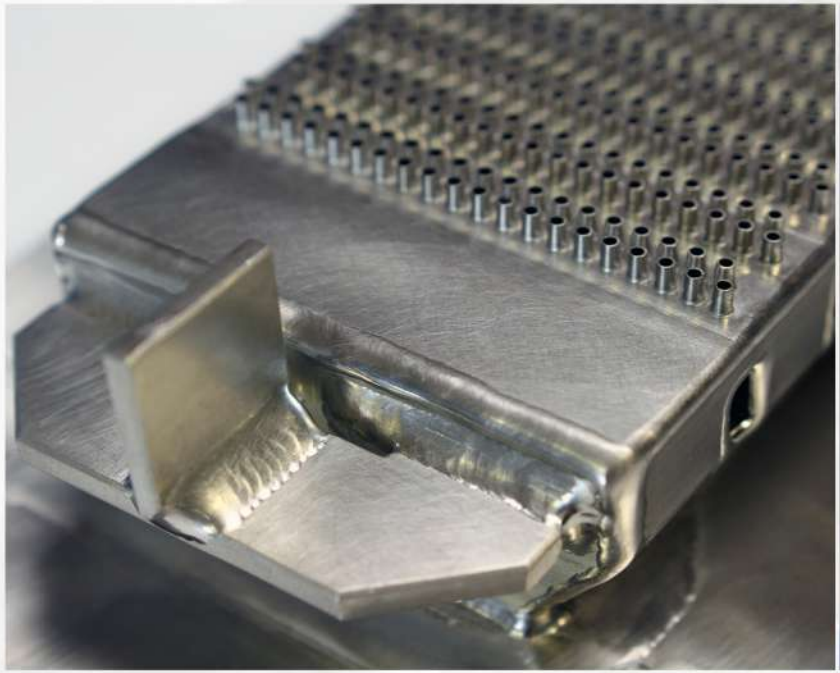
Stirrers are used to homogenize the molten glass before it enters the production line.

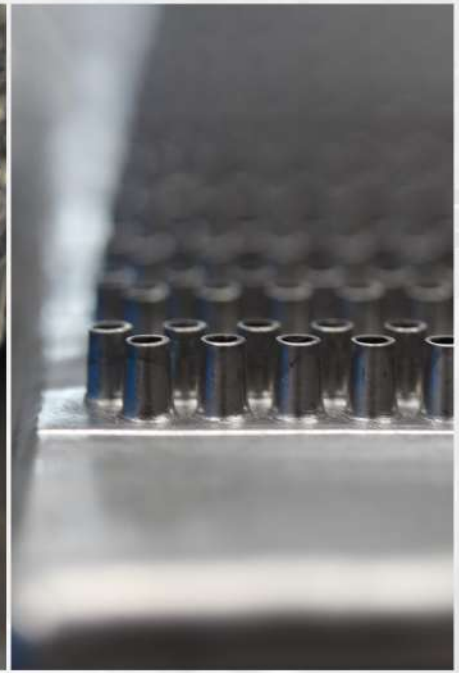
**Materials:**

- Pt 99,95/99,99%
- PtRh10/20/30
- PtPd10/20/30
- PtIr5/10/20/25
- PtAu5/10
- Pt GSP
- Ir 99,95%
- or on request

## Bushings

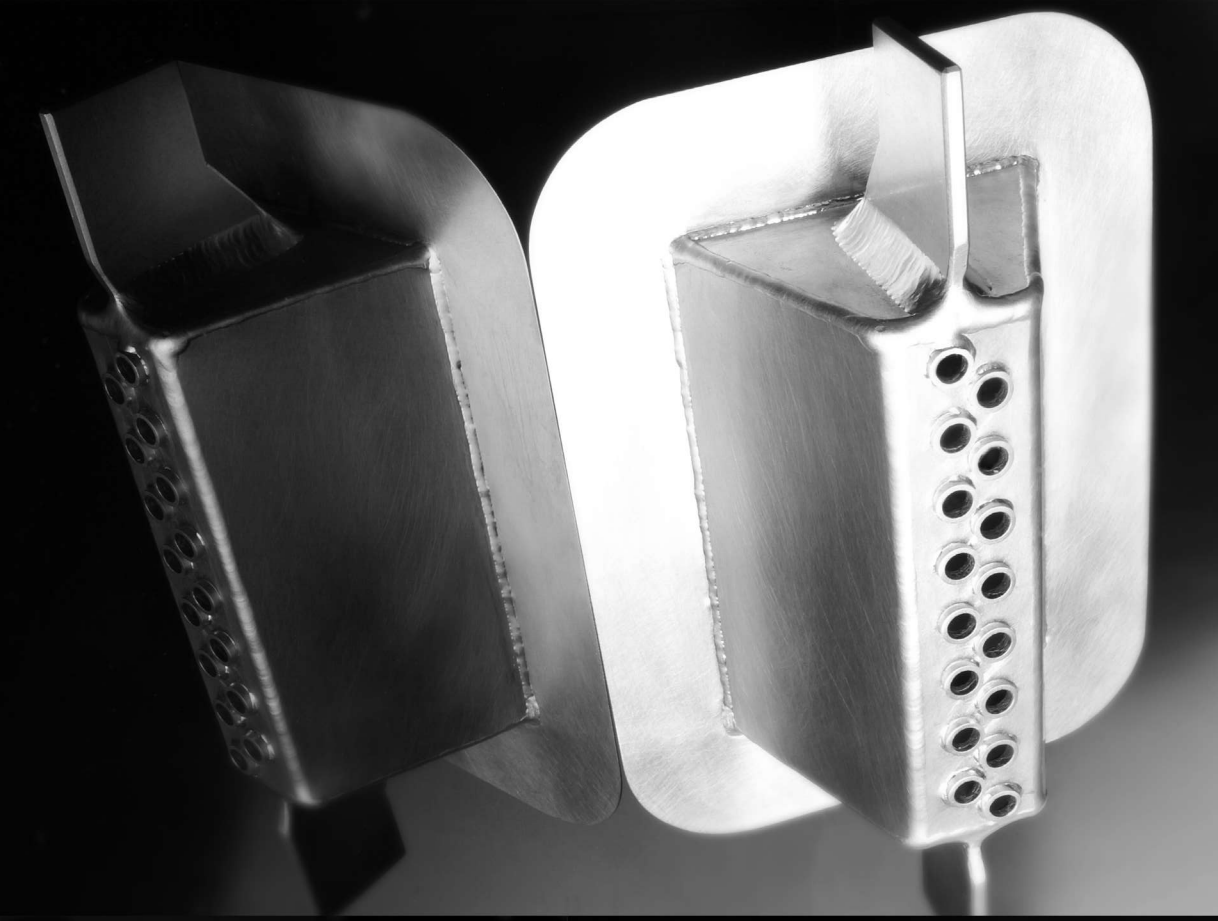
The products are used in glass factories for the production of glass (mineral) fibers. We offer both standard and customized production. We have introduced an innovative stabilized Pt GSP platinum to replace the costly Pt-Rh alloys and to ensure a longer material lifetime under extreme conditions.





**Materials:**

- Pt up to 99,99%
- Pt-Rh up to PtRh30
- Pt-Ir up to PtIr25
- Pt-Au up to PtAu10
- Pt GSP
- or on request



## Tubes and Thimbles

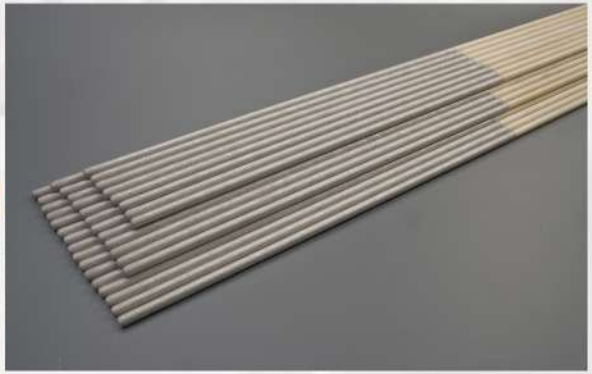
Tubes and thermowells are used as part of temperature sensors. These sensors are mainly installed in an environment that is very aggressive and where it is necessary to measure very high temperatures in the range of **600 - 1600°C.** The use of these sensors is, for example, in the glass industry for contact measurement of the temperature of molten glass. **Diameter: 0,9–25 mm / wall thickness: from 0,15 mm.**

**Materials:**

- Pt, Pd, Au, Ir
- PtRh10/20
- PtIr10
- PtAu5/10
- Pt GSP
- or on request

## Platinum Coatings

Safina offers thermal sprayed platinum either as a package including ceramics based on approved drawings, or using ceramics supplied by the customer. The coating thickness is usually **between 200 and 350 microns** depending on the intended use or by customer requirements. Platinum layers enable the protection and extended life of ceramic parts.



## Grain-Stabilized Platinum (GSP)

In demanding conditions of glass melting and processing **pure Pt** is very soft and exhibit rapid grain growth, which size can even reach throughout the whole cross-section thickness of the component (Fig. 1). This results in poor resistance to creep or grain-boundary contamination related fracture.

When **Rh or Ir alloying** is not desirable (e.g. due to high cost, glass discoloration or losses in oxidation conditions), **grain-stabilized Pt (GSP)** is the answer. This material contains finely dispersed zirconia ($ZrO_2$) particles that suppress grain boundary movement and act as obstacles for dislocations, therefore fine and oriented grain structure is stabilized even after prolonged exposure at high temperatures (Fig. 2).

This also greatly improves creep resistance, with several orders of magnitude longer time-to-rupture and minimal creep deformation compared to materials prepared by traditional casting and forming, as we produce this material with an advanced powder metallurgy process. Therefore, the material can be welded without porosity (Fig. 4) while retaining good resistance (Fig. 5) and processed in thin-walled products, which is necessary for production of hi-end products like bushings.

Microstructure after annealing 1500 °C / 20 h

Fig. 1 – Pure Pt with coarse equiaxial grains causing poor creep strength and easy grain-boundary diffusion of harmful elements

Fig. 2 – GSP with fine interlocked grains of high aspect ratio, which possess good resistance against

## Grain-Stabilized Platinum (GSP)

| | GSP | Pt | PtRh10 |
|---|---|---|---|
| Density (g/cm3) | 21,35 | 21,45 | 20 |
| Hardness * (HV10) | 75 | 42 | 102 |
| UTS * (MPa) | 230 | 134 | 300 |
| Elongation * (%) | 35 | 40 | 32 |
| Creep elongation ** (%) | < 5% | > 50% | |

* Annealed condition, measured at room temperature
** After fracture at 1200 °C after several dozen hours

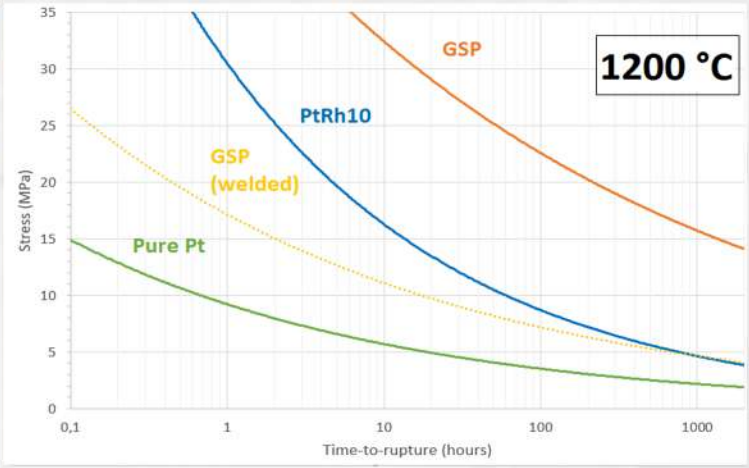



Fig. 3 - Stress-rupture curves measured at 1200 °C showing excellent creep resistance of GSP in base and welded conditions compared to traditional materials

Fig. 4 - Structure of TIG welded GSP part without any porosity

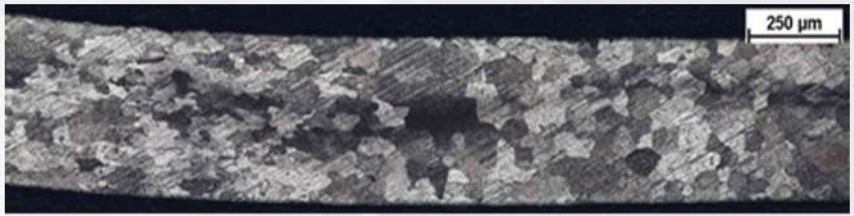



Fig. 5 - Welded and formed part exposed for 20 h at 1500 °C retaining fine-grained microstructure

# Other Special Products

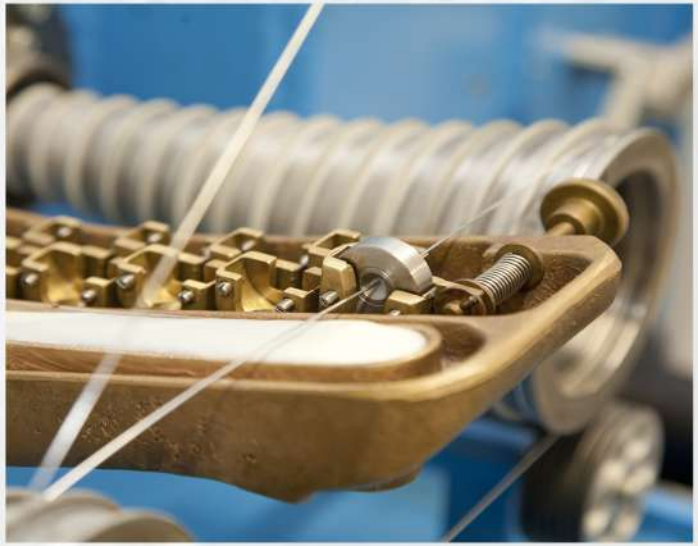
**Materials:**

- Pt 99,95/99,99%
- PtRh10/20/30
- PtPd10/20/30
- PtIr5/10/20/25
- PtAu5/10
- Pt GSP
- Ir 99,95%
- or on request

## Thermocouple Wires

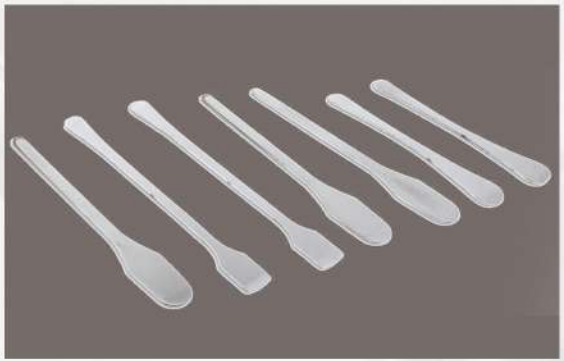
Safina is a renowned and traditional manufacturer of PtRh thermocouples. It has been dealing with their manufacturing for almost half a century. We offer standard (most frequently requested) diameters in stock, such **as 0,35 and 0,50 mm**, or alternatively any diameter **from 0,05 mm (50 µm) to 2,0 mm.** We provide flexible solutions to customized requests as well as support in selecting thermocouples to match your exact requirements. Chemical composition and calibration curve is evaluated for each batch. Measured values are compared to measurement standards, which are based on international norms.

| Type | Leg composition | Temperature range of application (°C) | | Tolerance |
|---|---|---|---|---|
| | | Long-term | Short-term | |
| S | Pt (–)<br>Pt – 10% Rh (+) | 0–1 300 | 0–1 600 | EN 60584-1<br>Class 1<br>ASTM E230/230M<br>Special tolerances |
| R | Pt (–)<br>Pt – 13% Rh (+) | 0–1 300 | 0–1 600 | EN 60584-1<br>Class 1<br>ASTM E230/230M<br>Special tolerances |
| B | Pt – 6% Rh (–)<br>Pt – 30% Rh (+) | 0–1 600 | 0–1 800 | EN 60584-1<br>Class 2<br>ASTM E230/230M |



## Laboratory Equipment

High quality laboratory equipment and instruments are indispensable implements in the laboratories and operations of the chemical, metallurgical, glass and ceramic industry.



**Products:**

- Crucibles
- Dishes
- Boats
- Stirring spattles
- Adjustable triangles
- Lids
- Shavels
- Tongs
- Tweezers and much more

**Materials:**

- Pt 99,95/99,99%
- PtRh10/20/30
- PtIr10/20/25
- PtAu5/10
- Pt GSP
- Ir 99,95%
- or on request

Safina offers possibility to modify the existing product or to produce the product to order according to the customer's wishes by mutual agreement and after the technical documentation is delivered by the customer.

## Recycling

We offer individual, tailor-made services, professional evaluation methods and the best refining technologies. Thanks to our refining equipment, we can ensure the highest possible purity of metals are obtained from various precious metal bearing materials.


**We Recycle:**

- **Industrial catalysts**
- **Chemical products**
- **Glass industry**
- **Medical and dental products**
- **Jewellery**
- **E-scrap**
- **Electronics and sensor technology**
- **Automotive catalytic converters**
- **Destructive and non-destructive cleaning**
- **Other residues and PGM residues containing precious metal**

**Materials:**

- Pt 99,95/99,99%
- PtRh10/20/30
- PtPd10/20/30
- PtIr5/10/20/25
- PtAu5/10
- Pt GSP
- Ir 99,95%
- or on request

Safina has maintained a quality management system according to ISO 9001 since 1997

and an environmental management system according to ISO 14 001 since 2005.

SAFINA

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