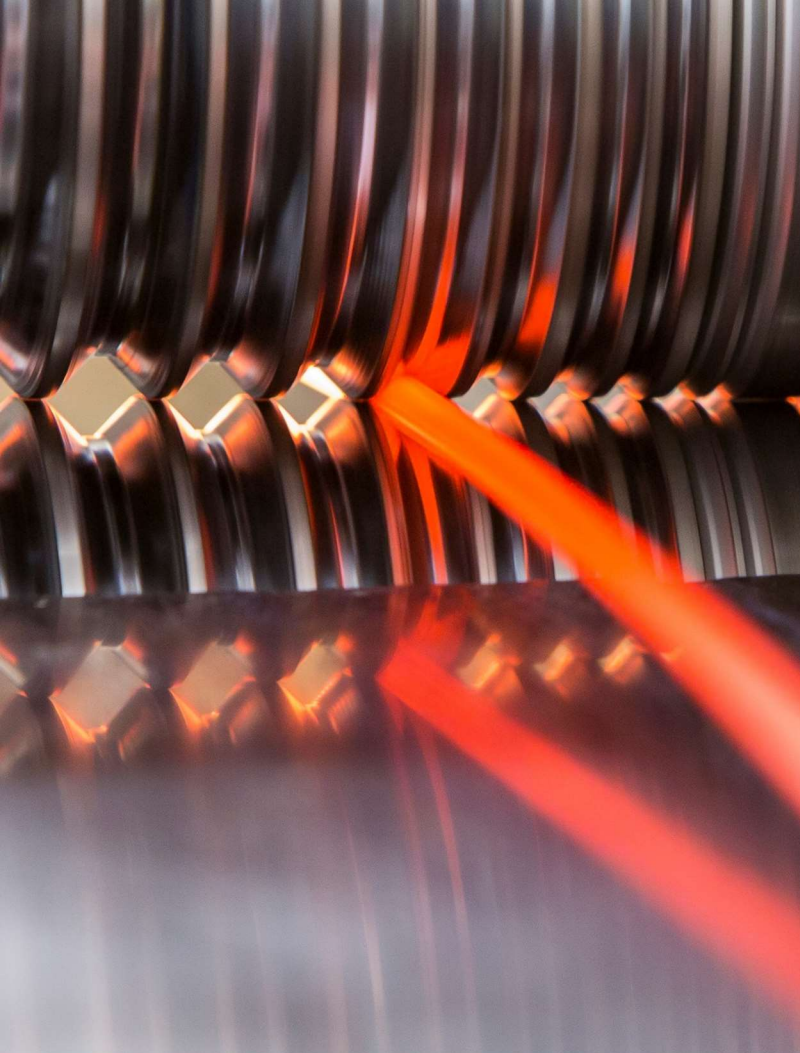




# **DPH-Alloys**

## **Innovative Precious Metal Solutions for the Glass Industry**

**GPC 2025**

**Nicole Staudt, Luca Krohn, Dr. Matthias Wegner**  
**08.10.2025 – Toledo, USA**

## HERAEUS – MATERIALS. INNOVATIONS. FOR GENERATIONS.



**1660**

Founding of Heraeus  
Family business



**Top 10**

Family-owned Companies  
In Germany



**> 25 bn. €**  
Total Revenue



**16.500**  
Employees  
Worldwide

**15**

Market-Oriented  
Operating Companies

## PRECIOUS METALS IN SPECIALTY GLASS INDUSTRY



# PRECIOUS METALS IN SPECIALTY GLASS INDUSTRY

## Applications

- Pharma Glass
- Optical Glass
- Display Glass

High Quality Glass is needed to meet property & safety requirements



## Requirements

- Corrosion Resistance
- Thermal stability
- Creep resistance

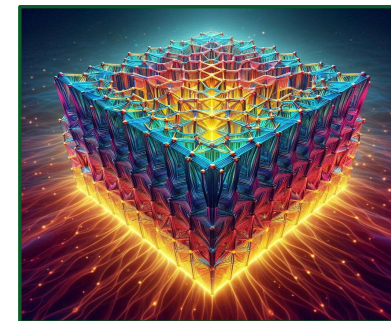
Glass Tools need to withstand harsh operating conditions without failing



## What Challenges Are Being Faced?

- Precious Metal is expensive
- Platinum is soft
- Alloys not always useable

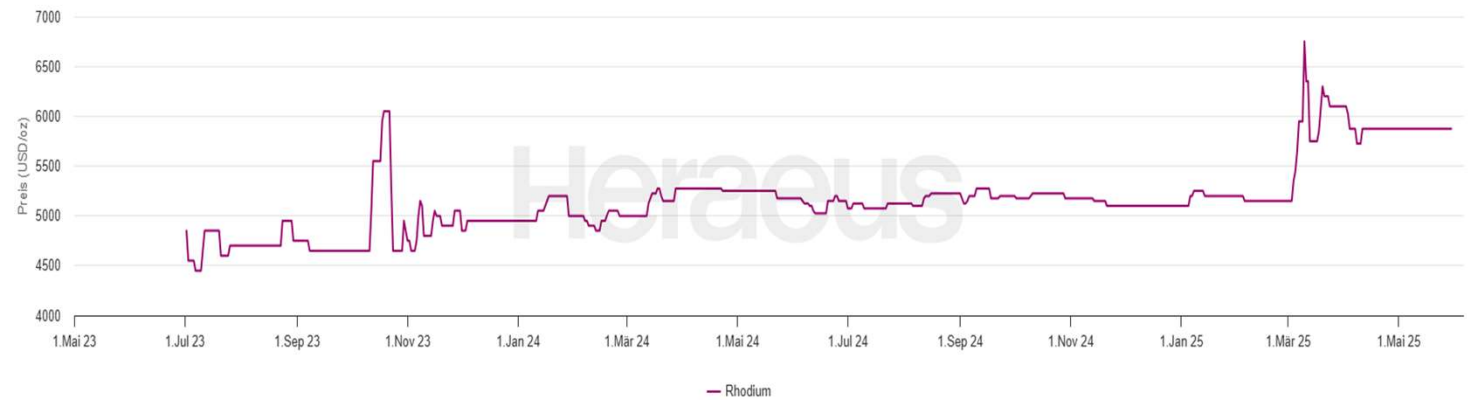
Advanced materials are required to increase durability & reduce precious metal costs



## PRECIOUS METALS IN SPECIALTY GLASS INDUSTRY

### Precious Metal Prices\*

- Pt 1.085 USD/oz
- Rh 5.875 USD/oz
- Au 3.300 USD/oz
- Ir 4.850 USD/oz
- Pd 980 USD/oz



- Several 100 kg of precious metal can be employed in a specialty glass production operation
- Precious metal prices are volatile (Rh: 2017 ~ 580 USD/oz \ 2021 ~ 29.000 USD/oz)
- Elimination / Reduction of Rh would be advantageous

\*30.05.2025

## REINFORCING PRECIOUS METALS - OXIDE DISPERSION STRENGTHENING

### Dispersion Hardened – Heraeus' Brand of Oxide Dispersion Strengthened (ODS) Materials



Corrosion resistance



Thermal stability



Creep strength



Ductility



Weldability

## DPH-PORTFOLIO

### DPH-Flex

- Newest addition to the family
- Excellent corrosion resistance
- Excellent thermal stability
- High creep strength
- High ductility
- Available as Pt & PtRh alloy

Perfectly suited for applications which require flexibility e.g. stirrer cells



### DPH-STRONG

- Proven in glass industries
- Excellent corrosion resistance
- Excellent thermal stability
- Very high creep strength
- Good ductility
- Available as Pt & PtRh alloy

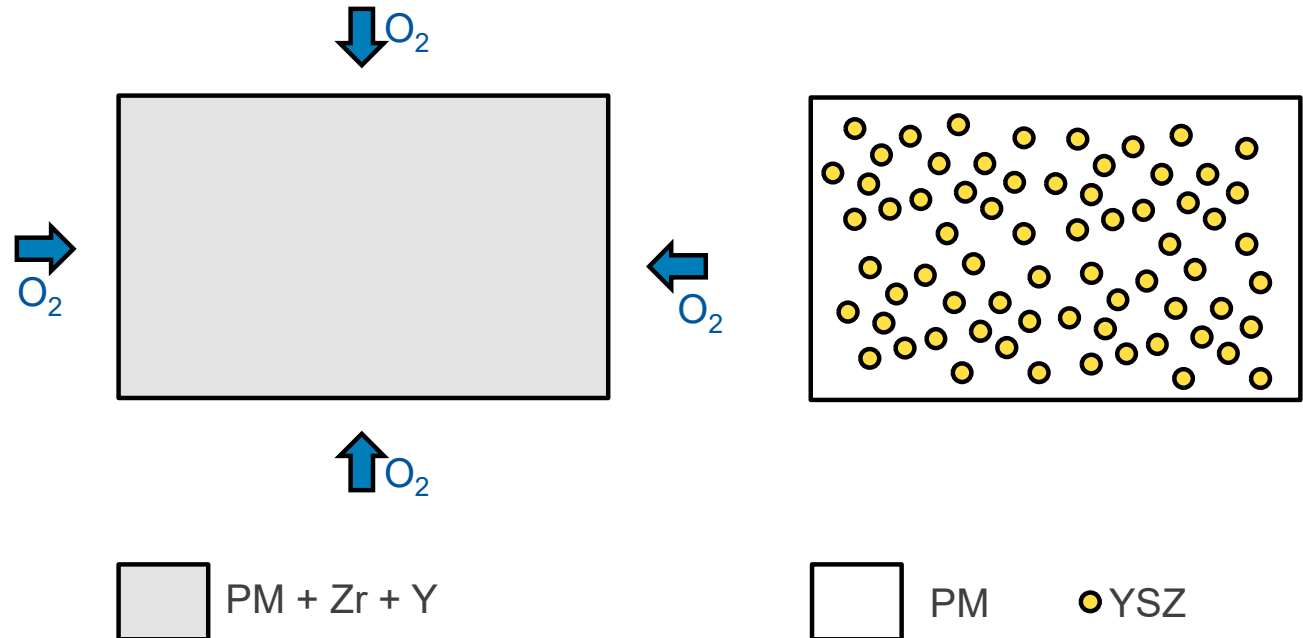
Perfectly suited for high stress applications with little allowance for deformation e.g. bushings or stirrers

## REINFORCING PRECIOUS METALS - OXIDE DISPERSION STRENGTHENING

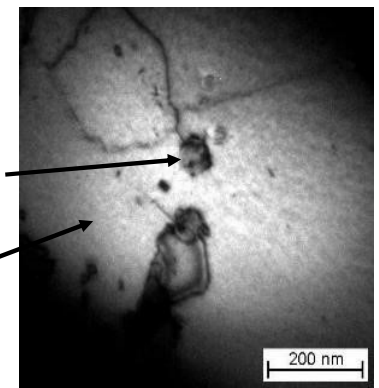
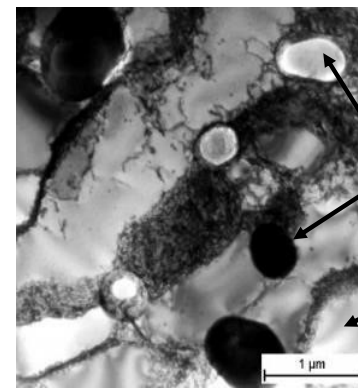
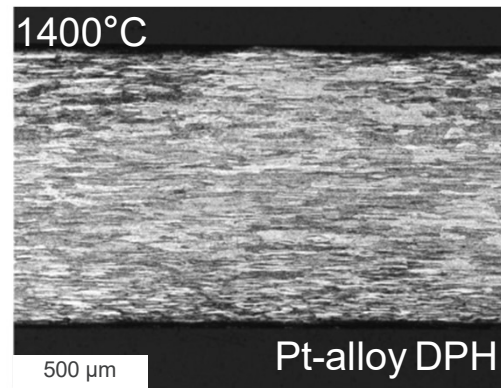
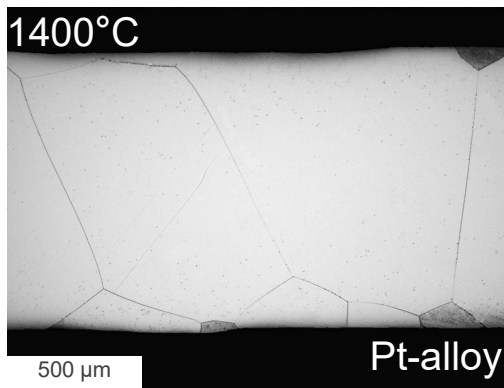
Dispersion of small oxide particles in a precious metal matrix via 3 principle routes

- Powder Metallurgy
- Chemical Precipitation
- Internal Oxidation

Diffusion annealing process in a controlled oxygen atmosphere leads to precipitation of oxide dispersoids

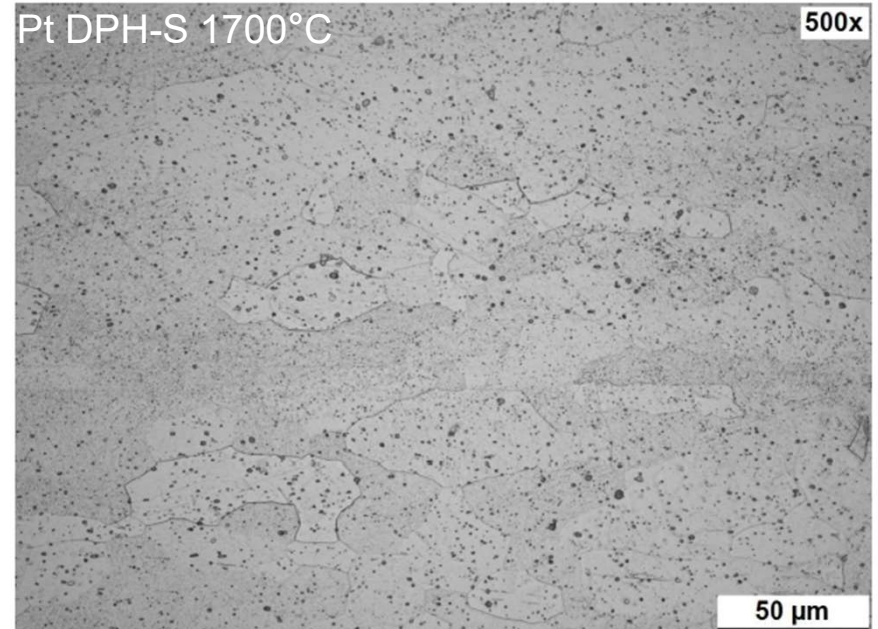
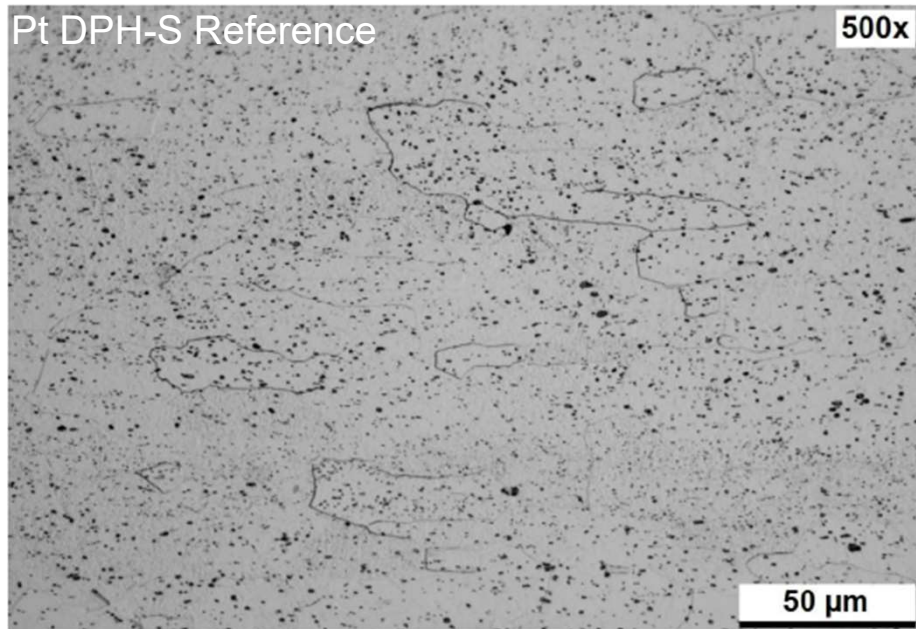


## REINFORCING PRECIOUS METALS - OXIDE DISPERSION STRENGTHENING



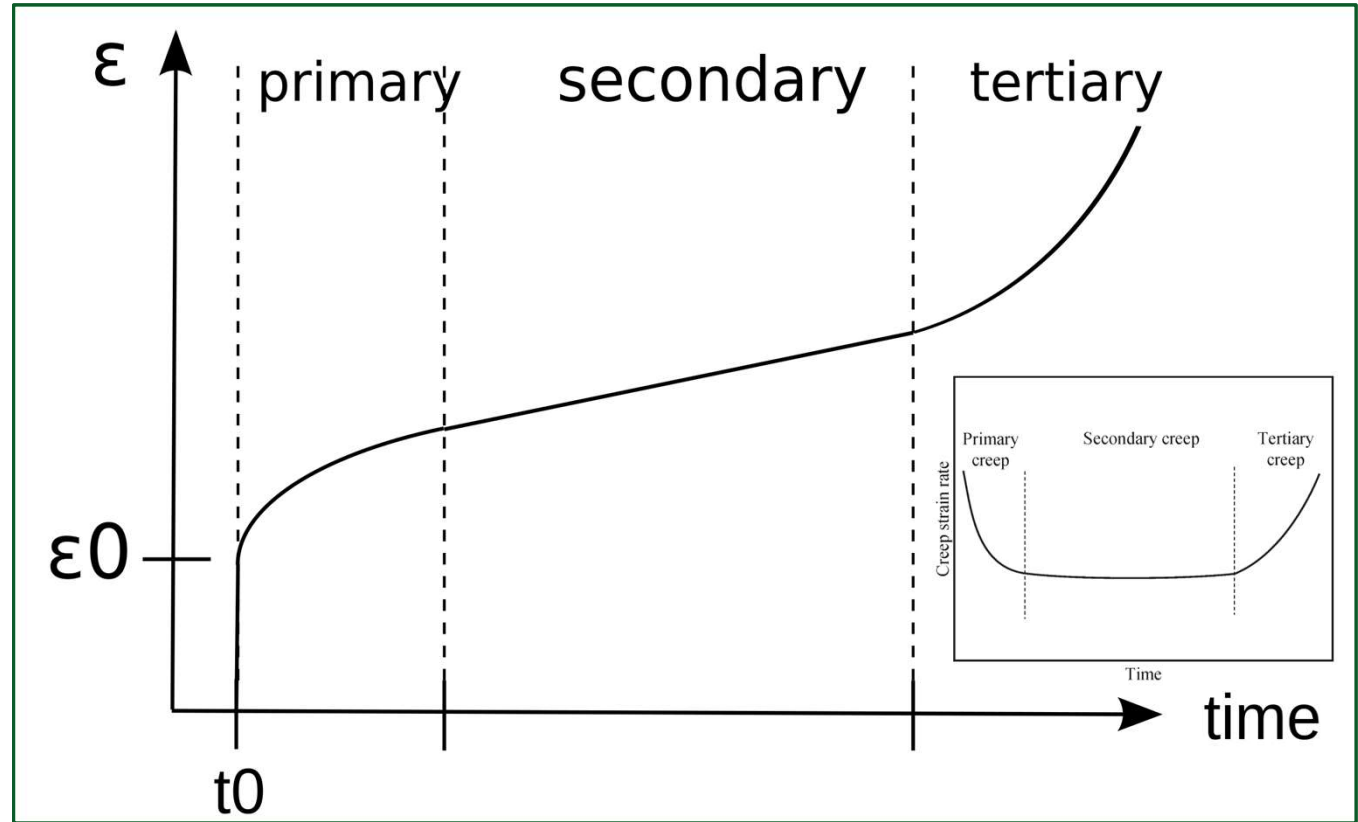
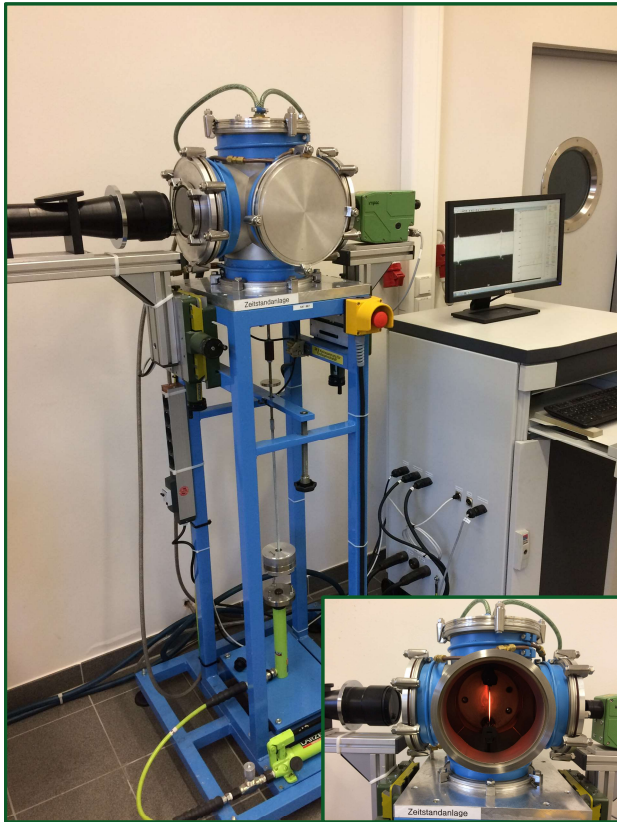
- YSZ particles are homogeneously distributed in the precious metal matrix
- Stable microstructure over extended periods of time @ elevated temperatures

## REINFORCING PRECIOUS METALS – DPH-STRONG

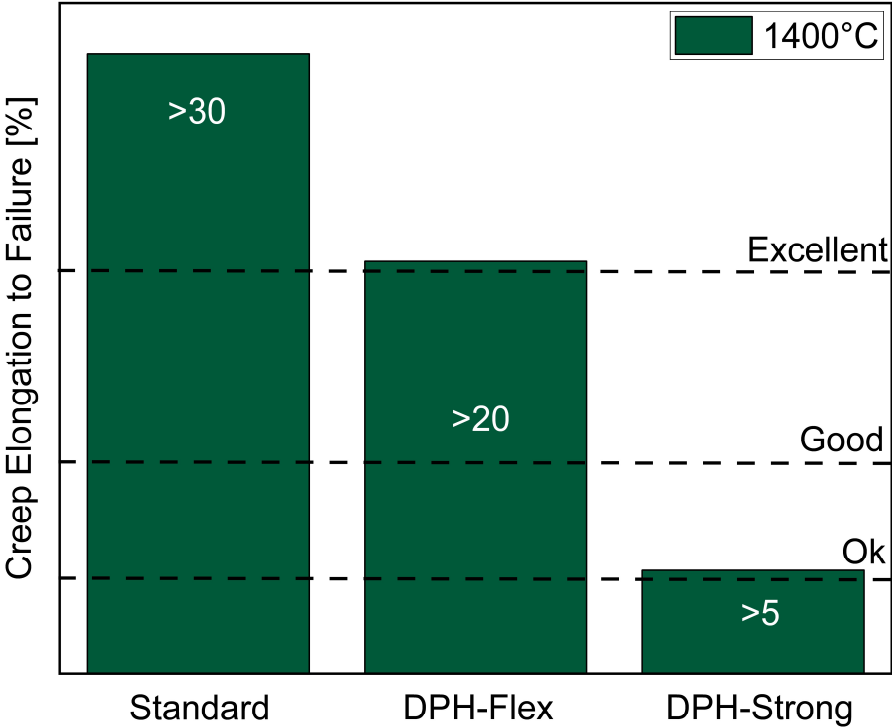
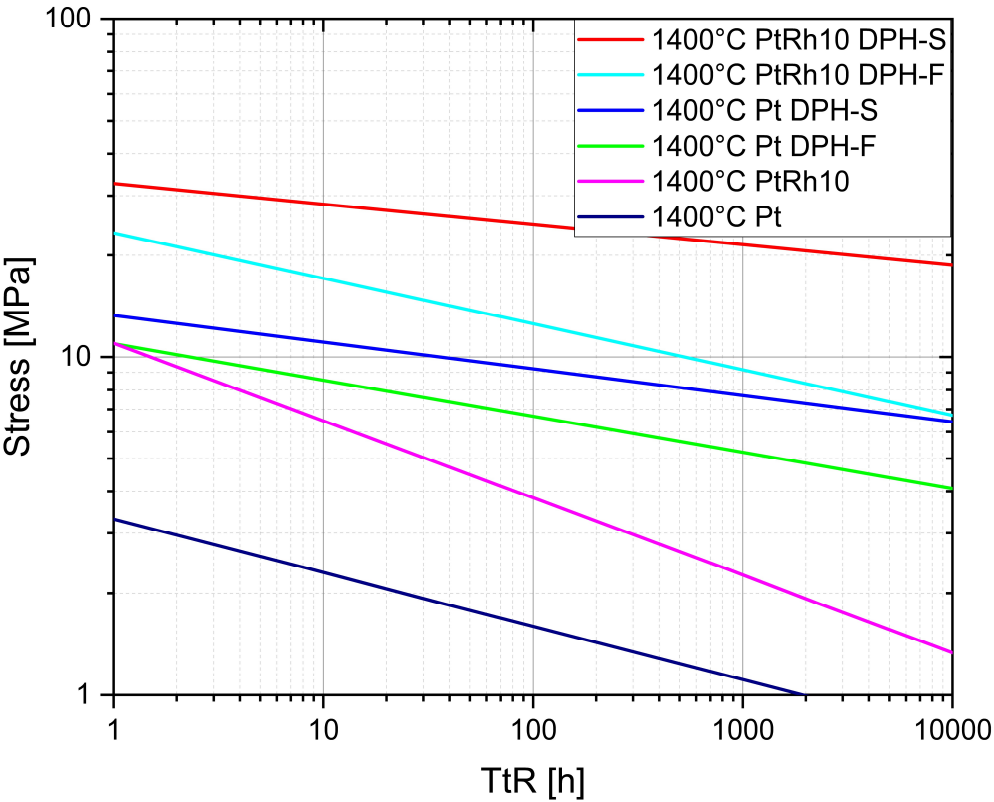


- Platinum DPH-S can survive @ 1700°C ( $T_M$  1769°C) for extended periods of time without changes in structure or properties!

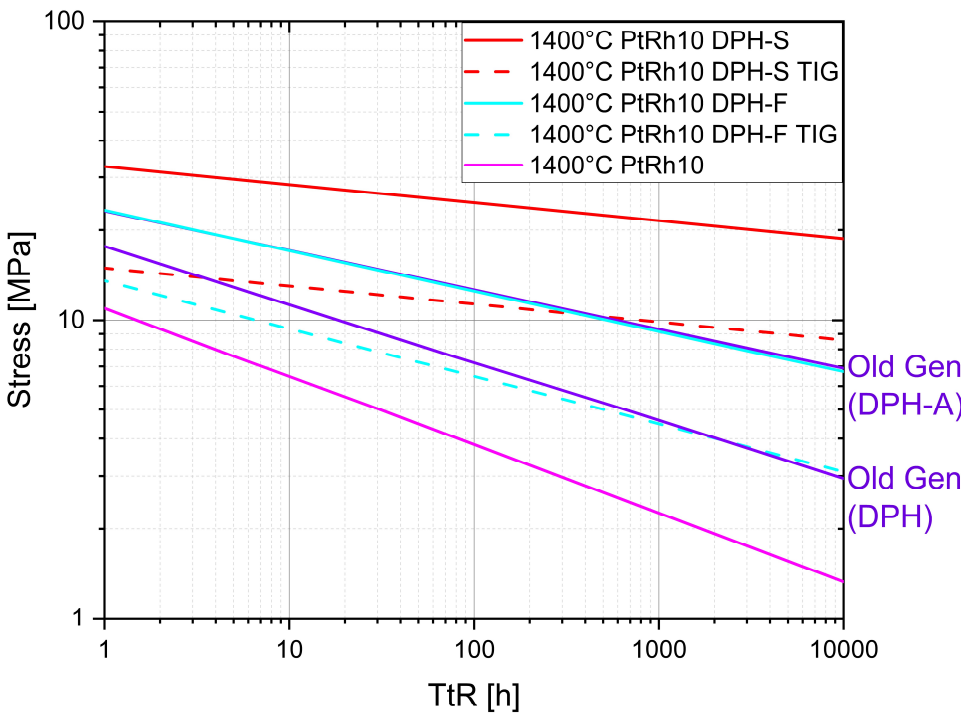
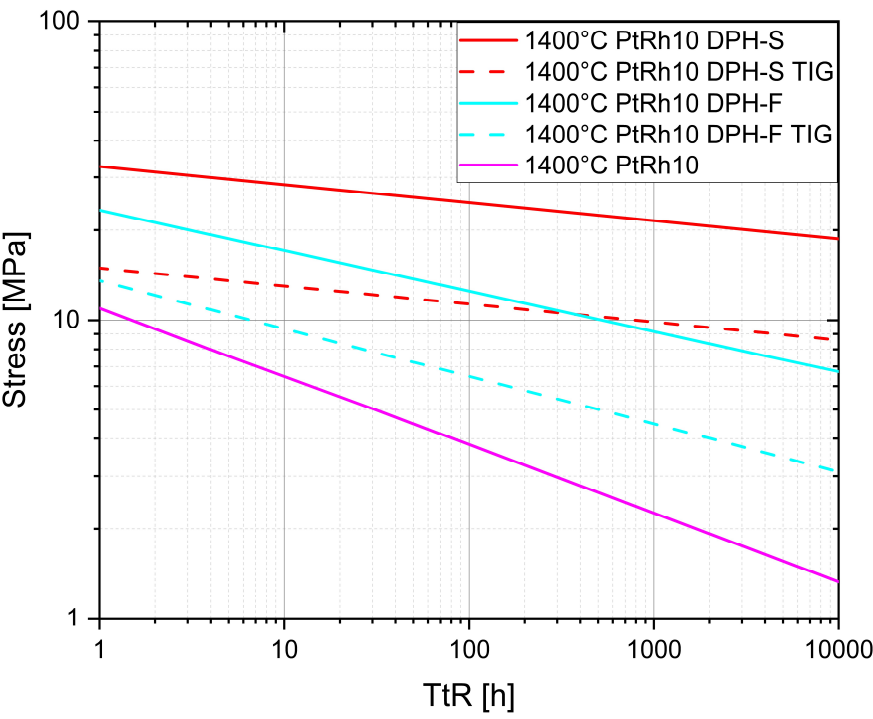
## HIGH TEMPERATURE PROPERTY MEASUREMENT – CREEP RUPTURE TEST



DPH-PROPERTIES – CREEP STRENGTH & DUCTILITY



DPH-PROPERTIES - WELDABILITY



## SUMMARY & CONCLUSIONS

### DPH-STRONG & DPH-FLEX ALLOYS

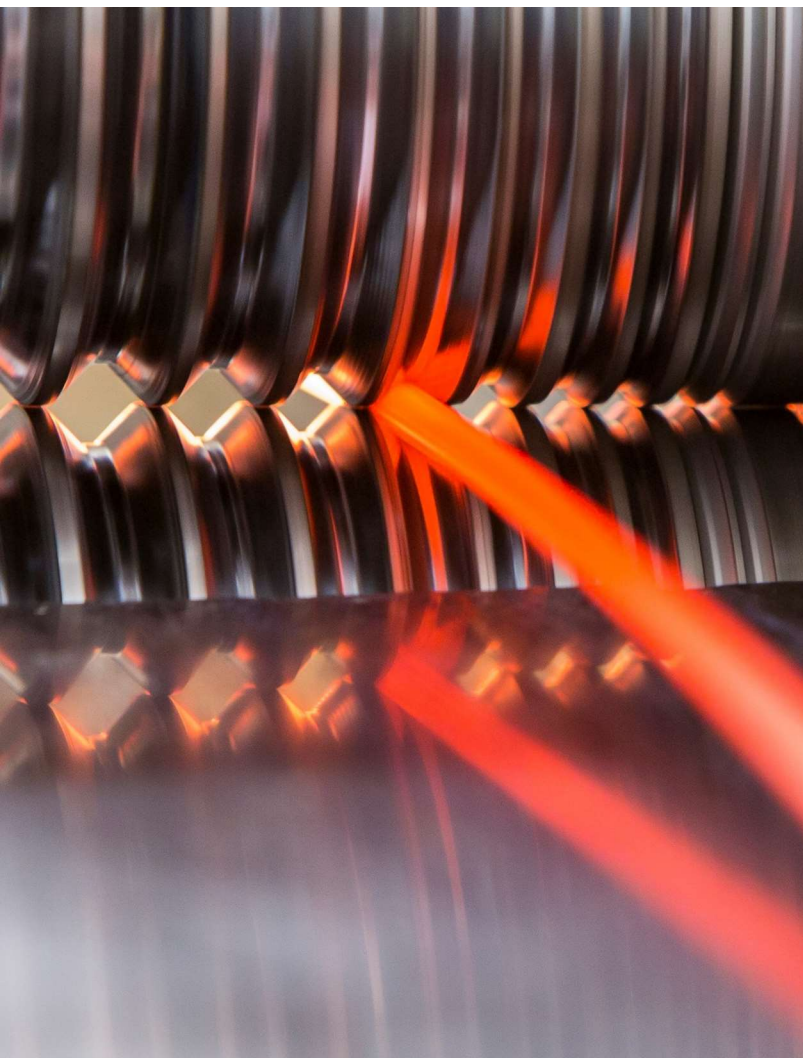
- **EXHIBIT MORE THAN 2X HIGHER CREEP RESISTANCE WITH RESPECT TO PREVIOUS GENERATION'S ODS ALLOYS**
- **USEABLE AT TEMPERATURES APPROACHING THE ALLOY'S MELTING POINT**
- **OFFER A SUBSTANTIAL COST SAVING POTENTIAL THROUGH THE REDUCTION OF PRECIOUS METAL AND/OR ELIMINATION OF RHODIUM**

WOULD YOU LIKE TO KNOW MORE?

## **ACCESS THE HERAEUS MATERIAL DATABASE**

- **QUICK & EASY ACCESS**
- **NO REGISTRATION**
- **GET IN TOUCH WITH OUR EXPERTS**





**Thank You!**