SWTEST

PROBE TODAY, FOR TOMORROW

2022 CONFERENCE

Palysium
a revolutionary material for probing

Heraeus

Precious Metals

Dr. Jonas Fecher
Jonas Sorg, Marc Rättig

June 5 - 8, 2022

Heraeus through the ages

31.5 bn. €
TOTAL REVENUE
in 2020

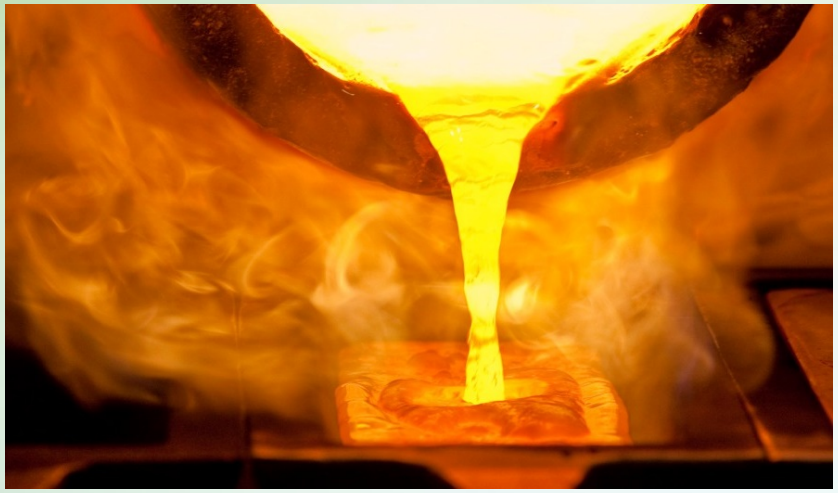
15.000
EMPLOYEES
worldwide

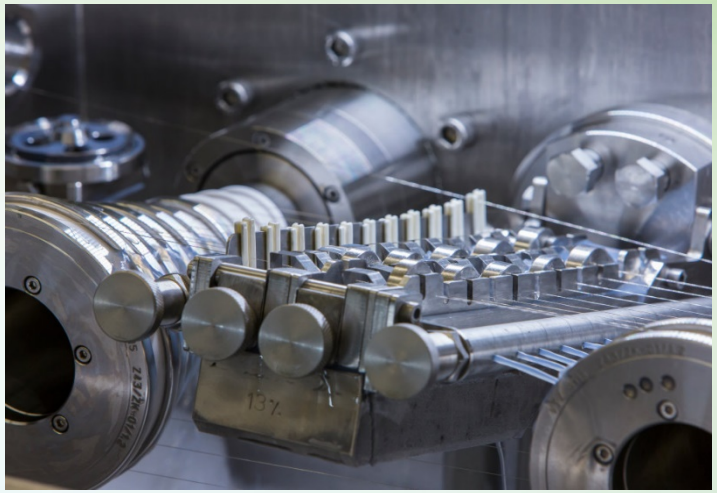
11 market-oriented
GLOBAL BUSINESS UNITS

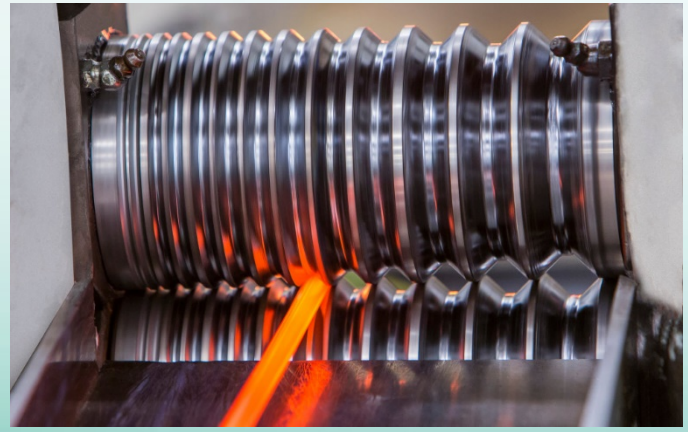
1660
Founding of the
Heraeus family business

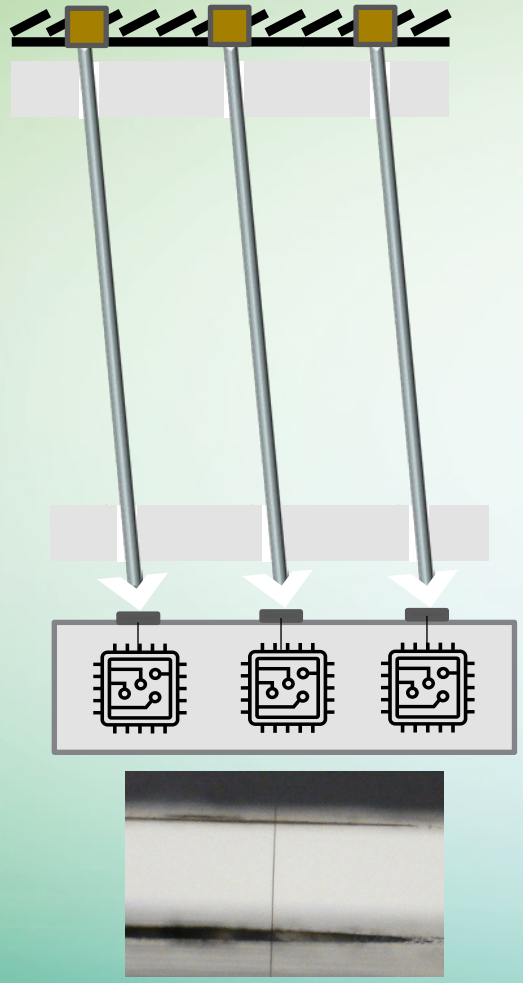
2022
Fortune 500 company

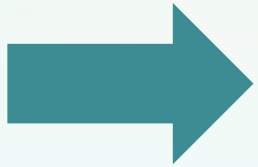
Palysium production at Heraeus Precious Metals

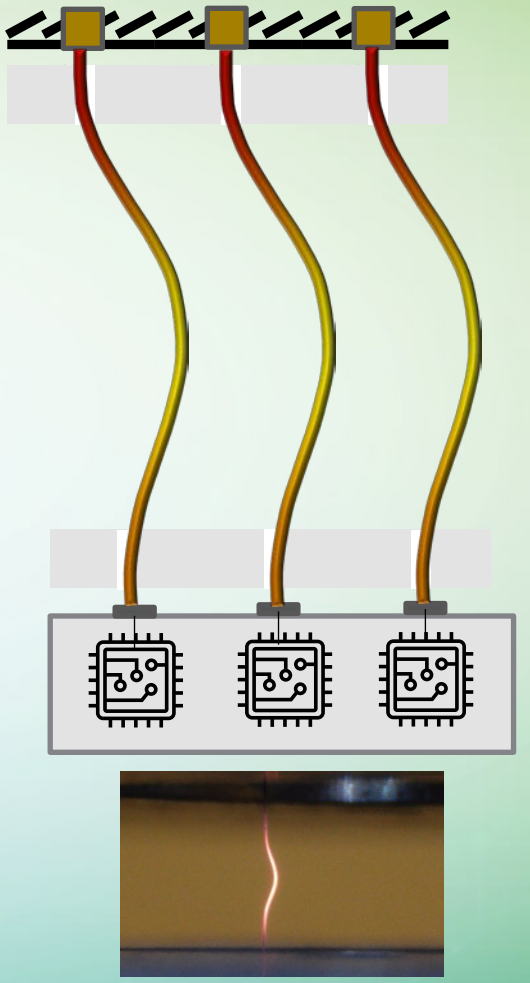






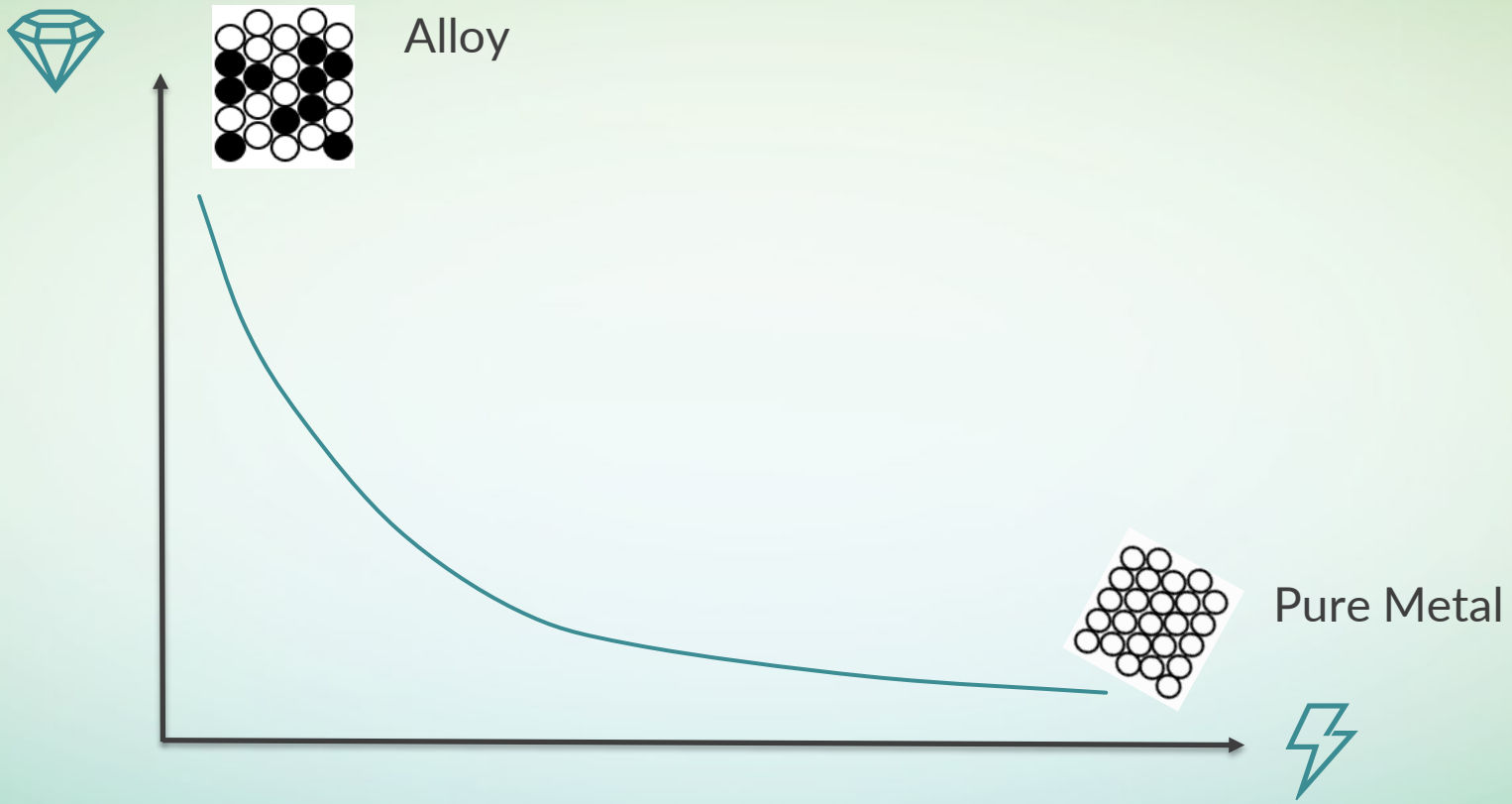




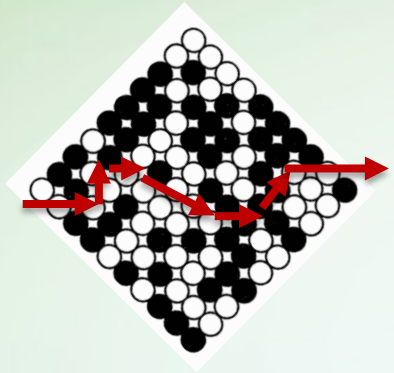


Mechanical and electrical properties (41 µm wire)

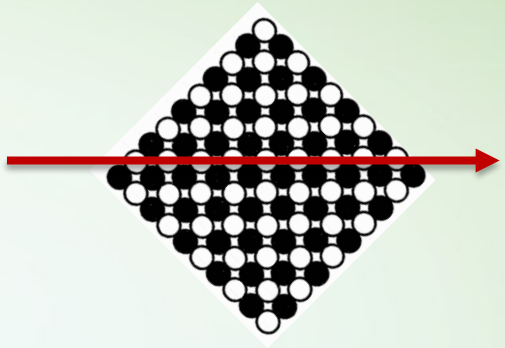
	Hera 6321	Palysium
Young‘s modulus	112 GPa	120 GPa
Yield strength	1300 - 1450 MPa	1250 - 1500 MPa
Conductivity IACS	~ 10 %	**> 24 %**


Alloy
Pure Metal

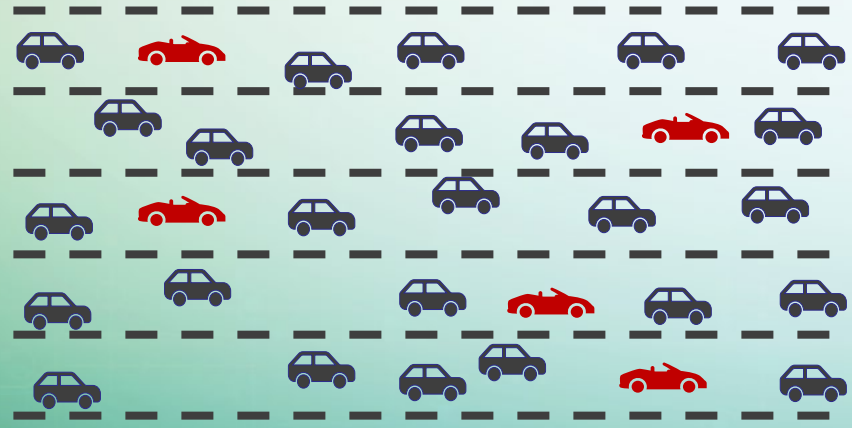
Alloys: random distribution



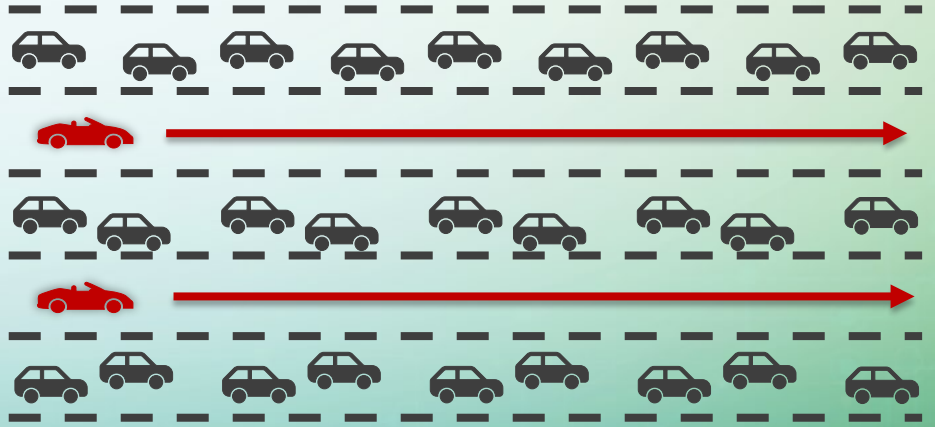
Palysium: ordered superlattice



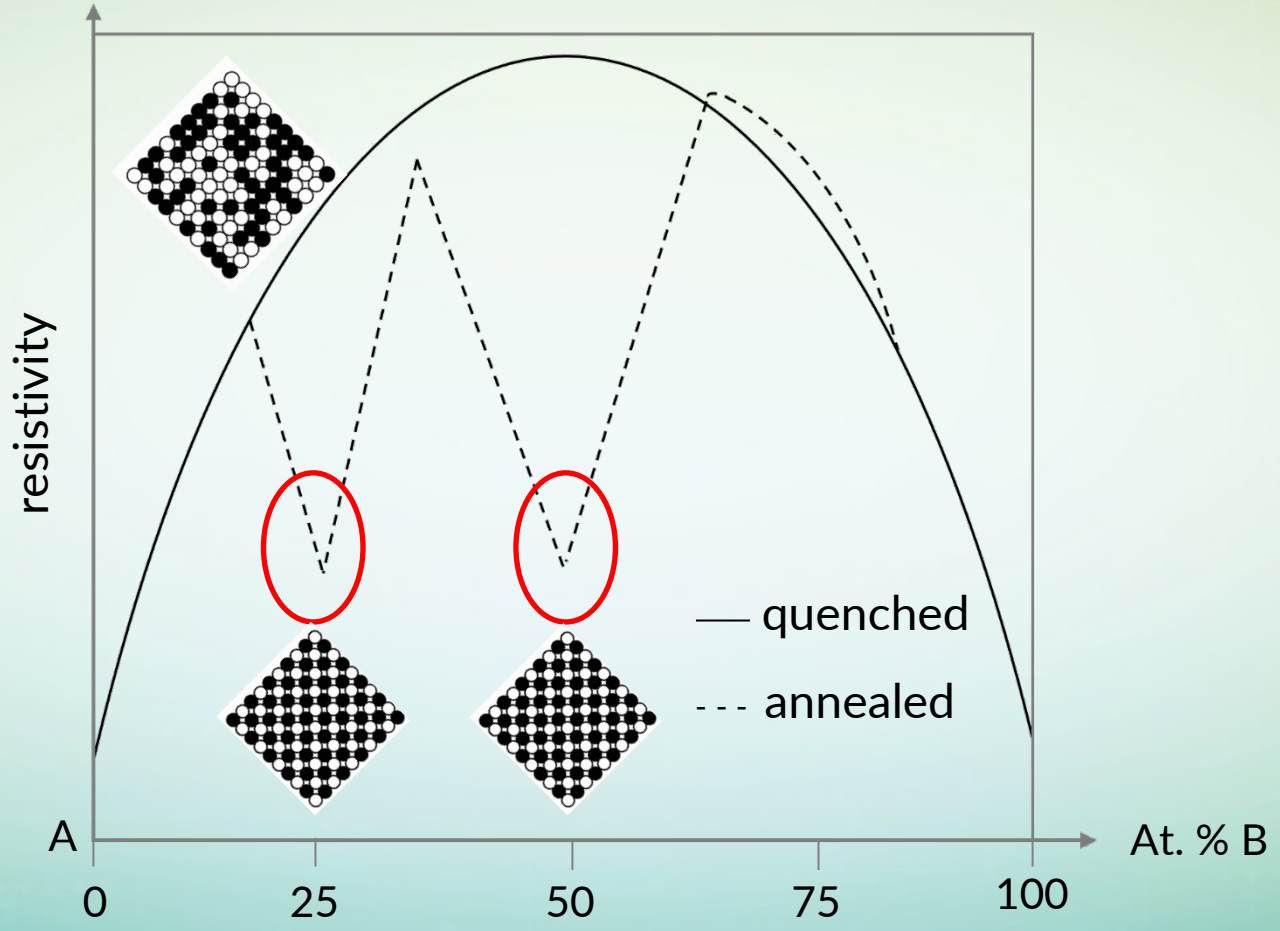
Congested lanes

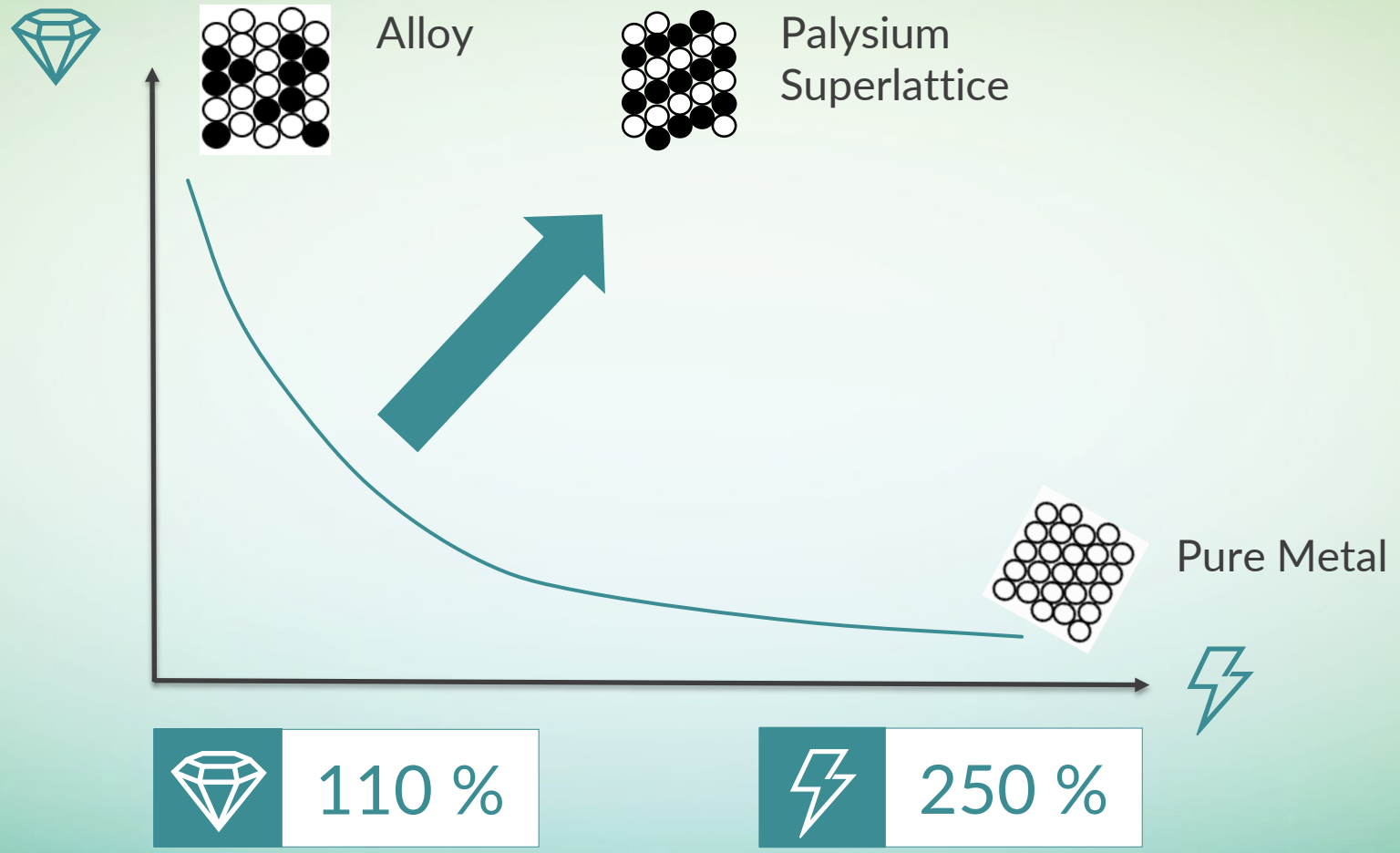


Superlattice „free“-way

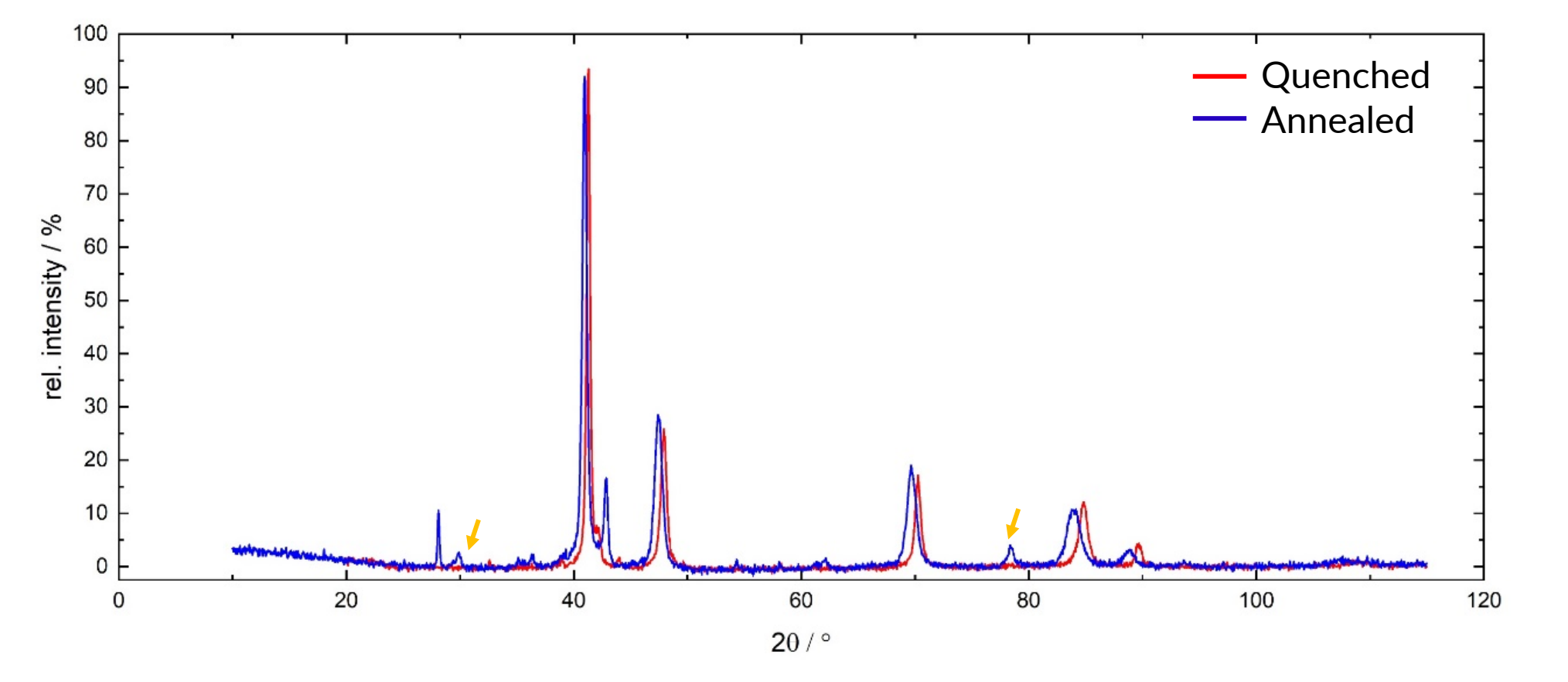


Reduction of resistivity at certain compositions



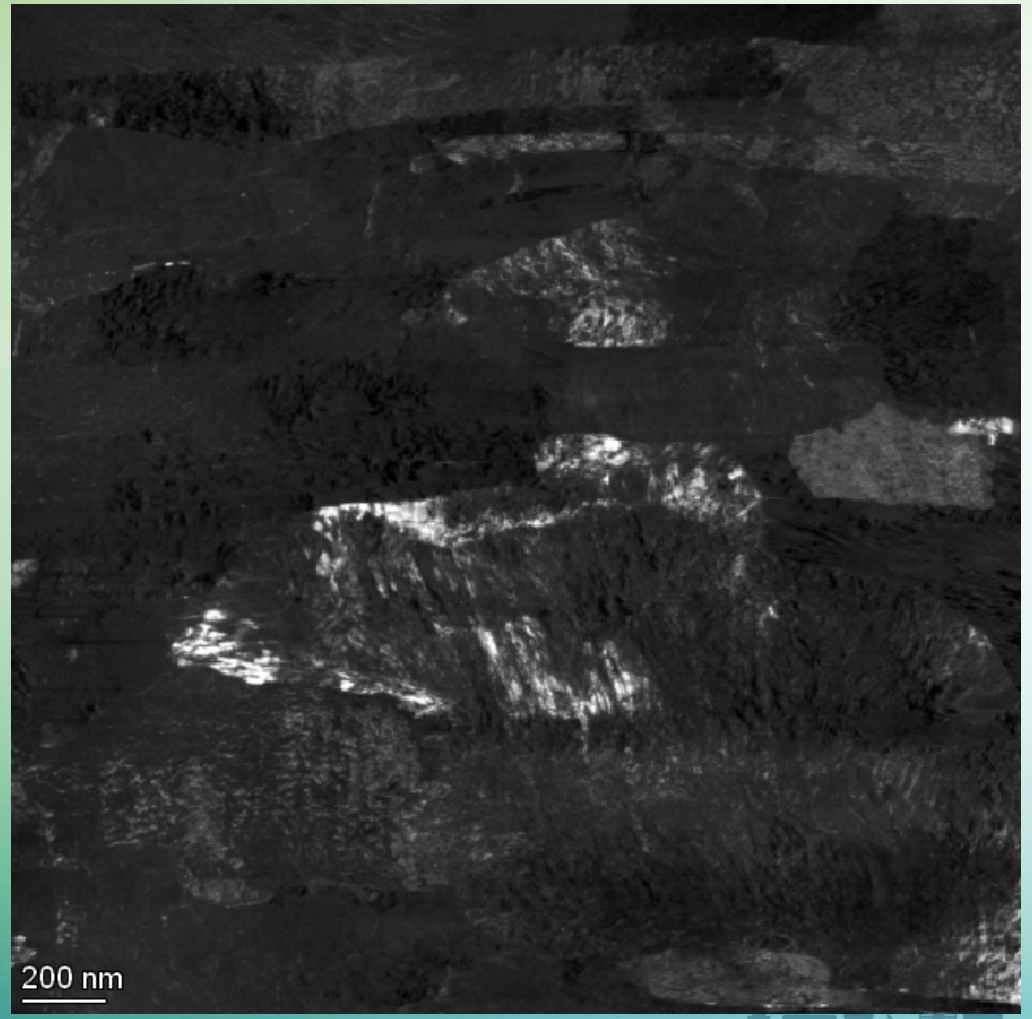

Alloy
Palysium
Superlattice
Pure Metal
110 %
250 %

XRD Measurements Palysium

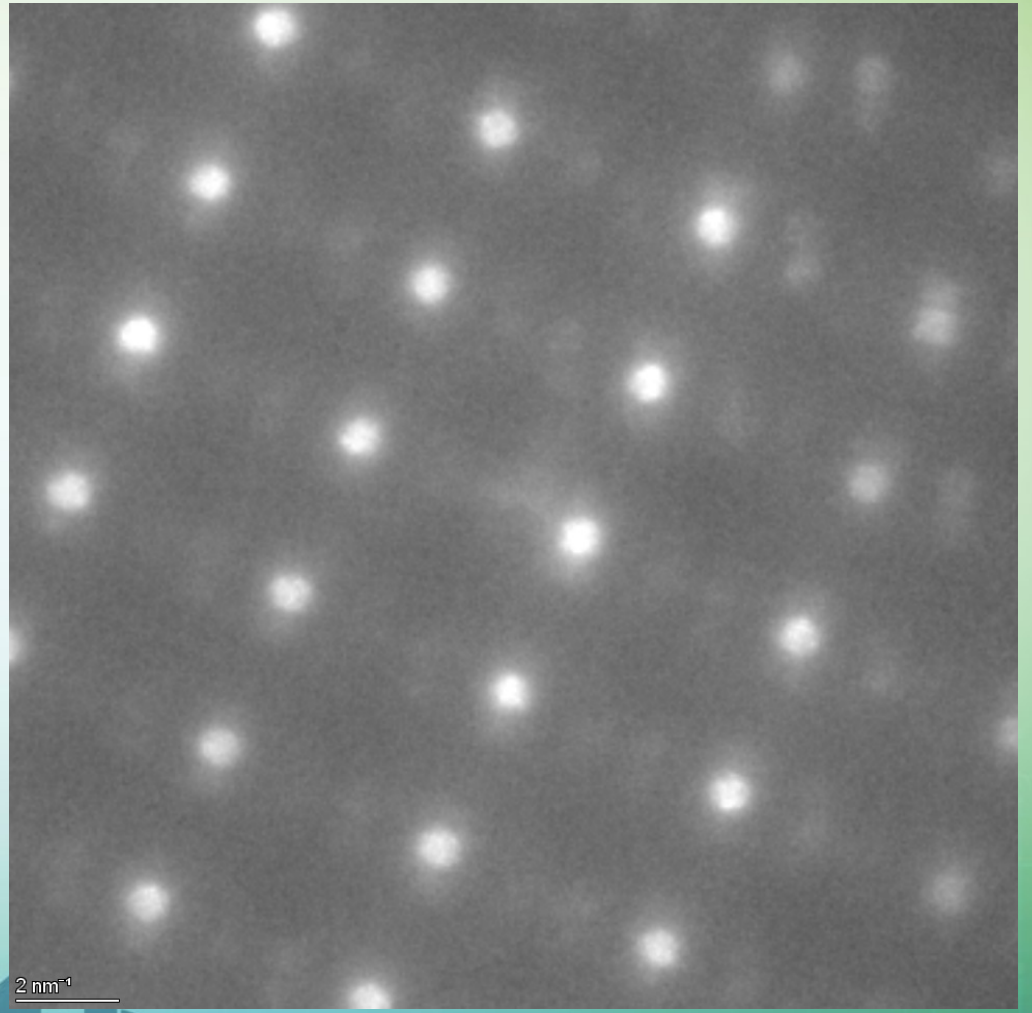


TEM investigations

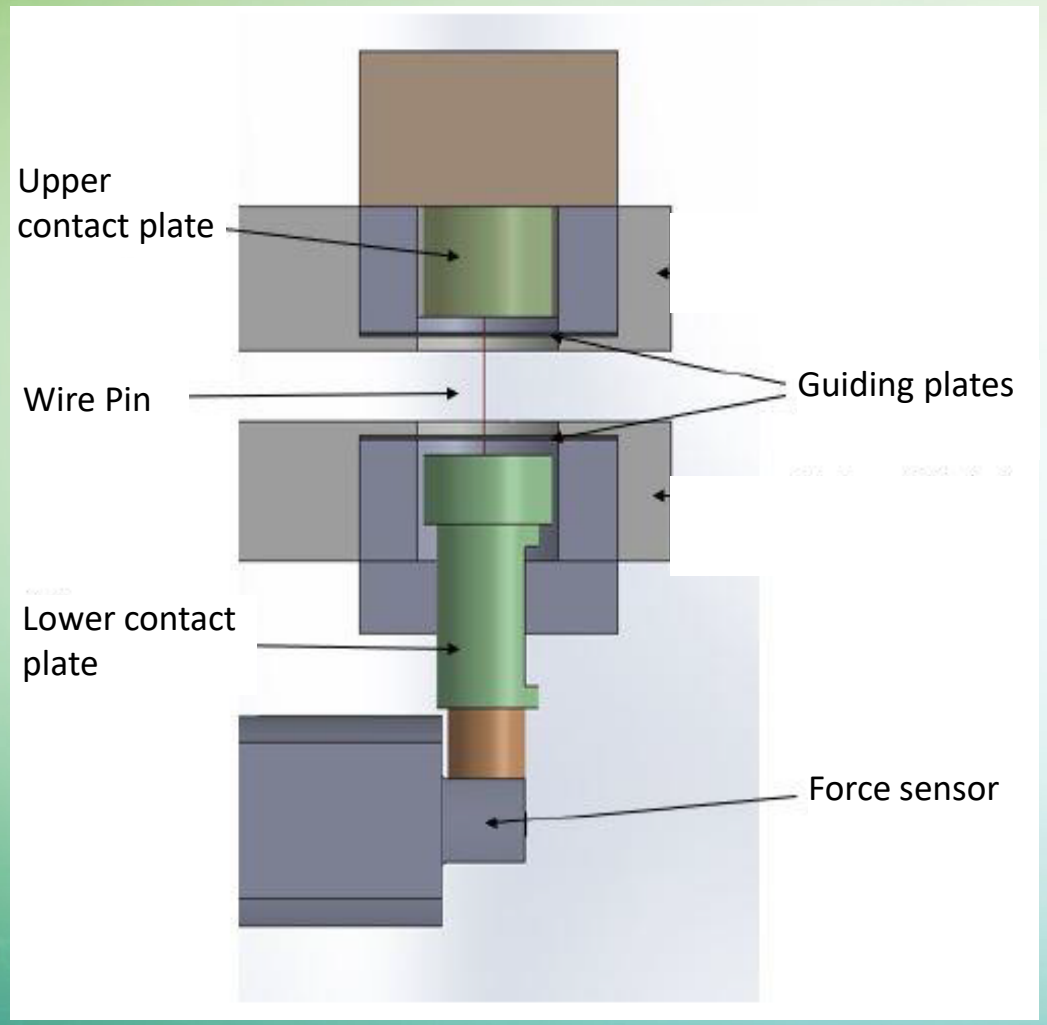
STEM picture superlattice



Diffraction pattern of superlattice structure

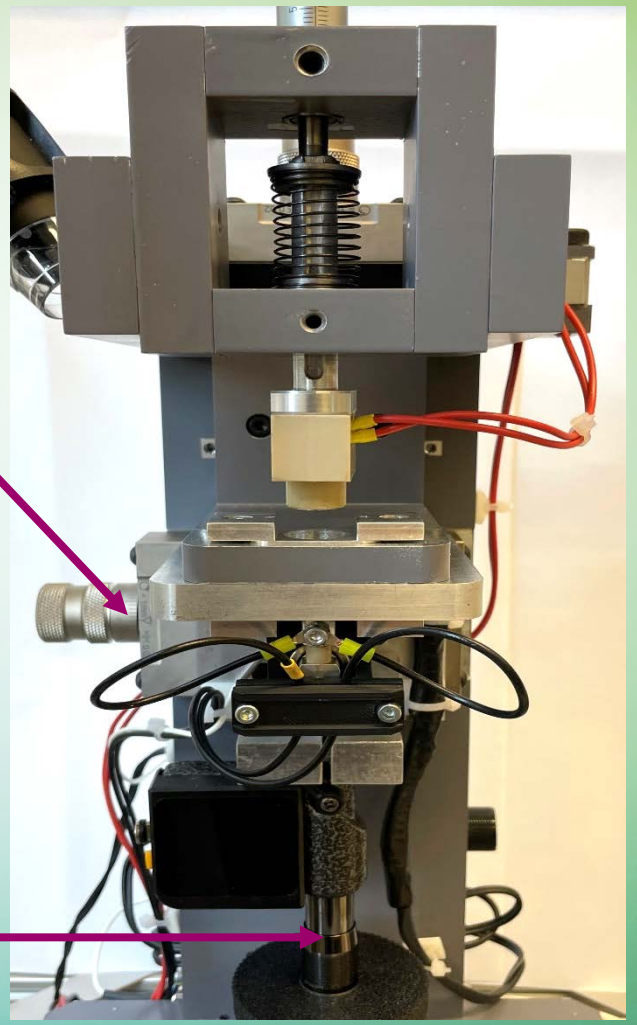


CCC / MAC Measurement



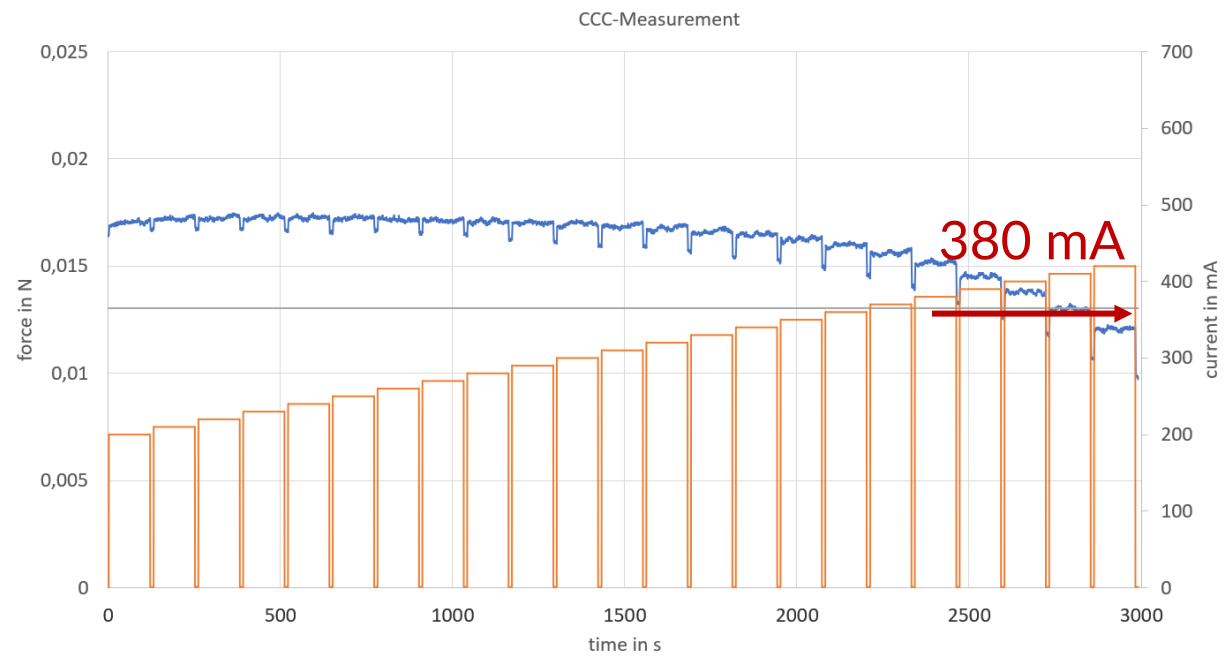
X-axis offset adjustment of lower guiding plate

Overtravel adjustment and z-measurement

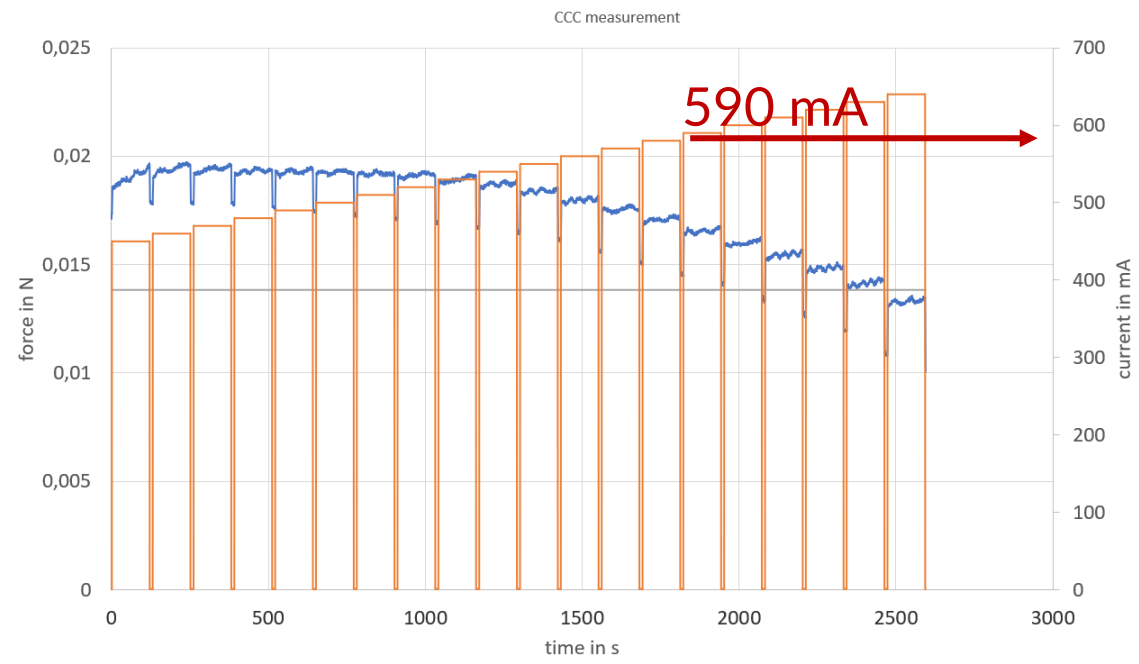


CCC Measurement

HERA 6321

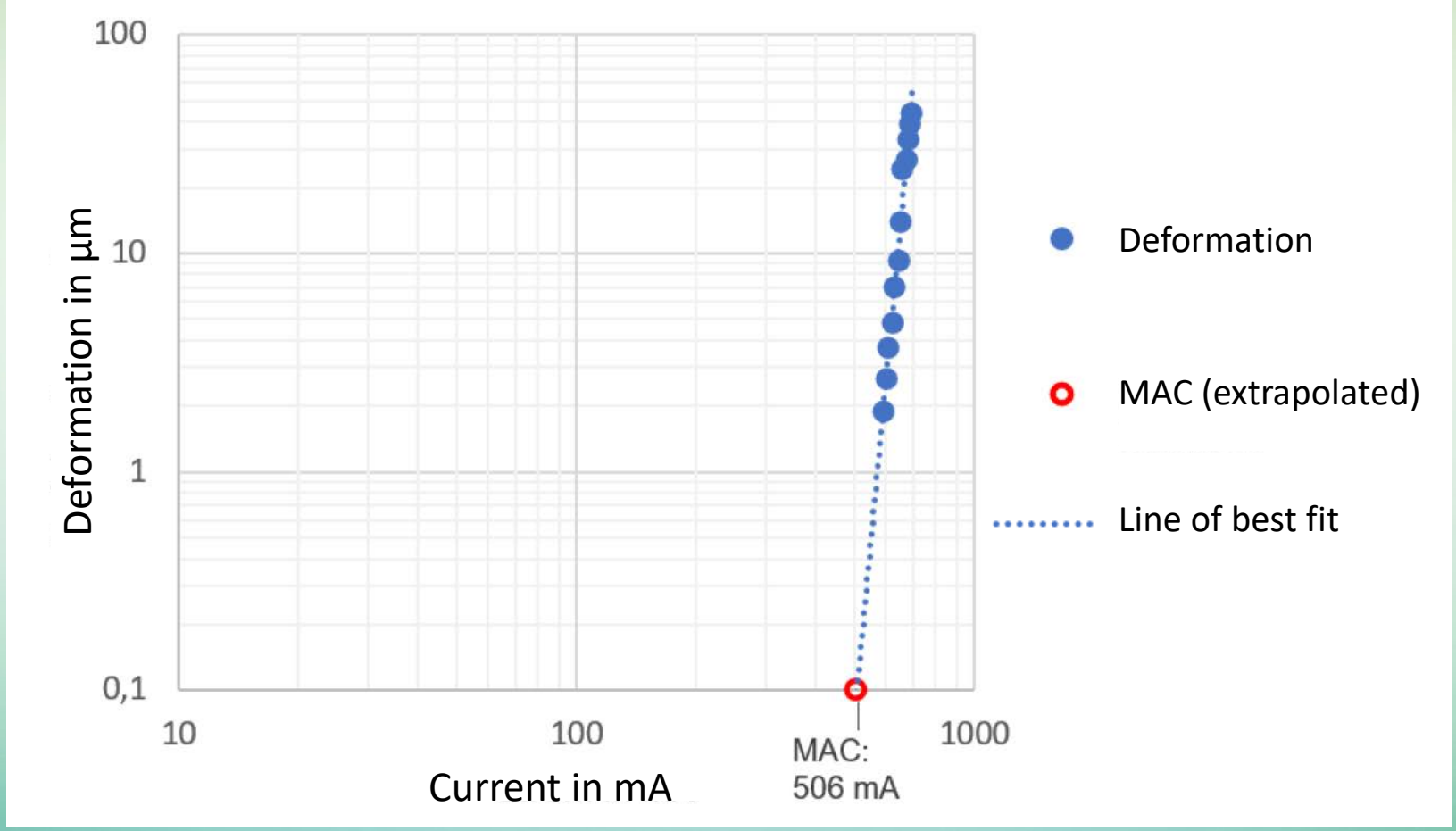


PALYSIUM



Parameters: 41 µm diameter, 8 mm length, flat tip and end, Overtravel 75 µm, Offset 250 µm, 120s current cycle time, 10 s pause between cycles, room temperature

MAC Measurement Palysium

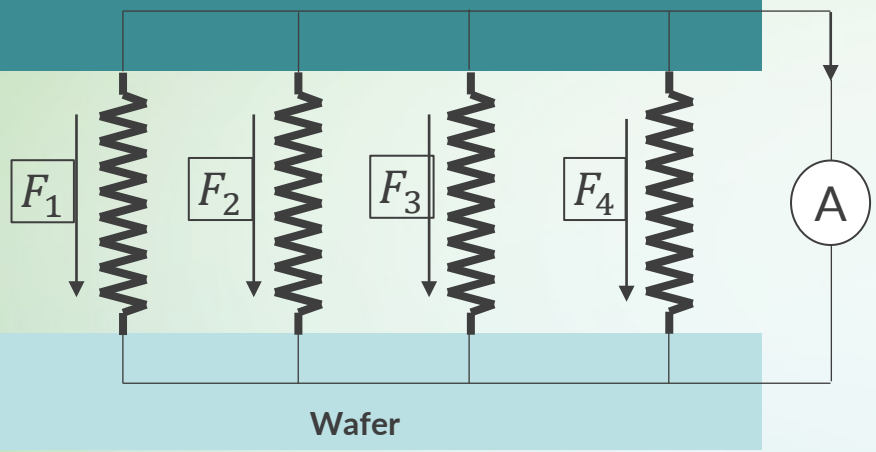


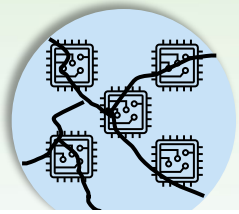
Mechanical and electrical properties (41 µm wire)

	Hera 6321	Palysium
CCC	380 mA	590 mA
CCC	100%	**155%**
MAC	290 mA	506 mA
MAC	100%	**175%**
Young‘s modulus	112 GPa	120 GPa
Yield strength	1300 - 1450 MPa	1250 - 1500 MPa
Conductivity IACS	~ 10 %	> 24 %

Palysium Benefit – Same Force with increased Pin Number (Theoretical Example)

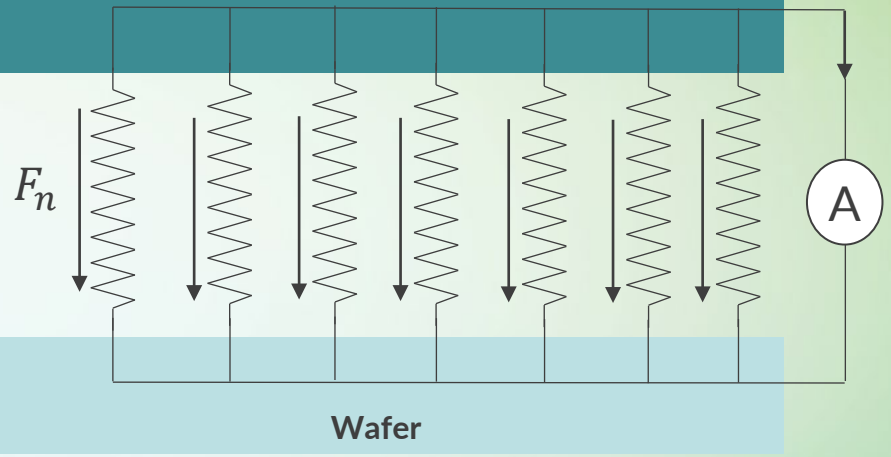
Hera 6321 (10% IACS)





Too much force leads to wafer cracks

Palysium (25% IACS)



4 Probes	Each Probe 100 mA	Ø 76 µm	Probe Force 50 cN

Total Force 200cN

7 Probes	Each Probe 100 mA	Ø 57 µm	Probe Force 28.5 cN
Smaller probe Force	Higher conductivity	Higher conductivity	Smaller diameter

Total Force 200cN

Same total force, same current per pin but 75% higher pin count. Smaller pitch possible

Conclusion

- Heraeus has developed a material with 2.5 x higher conductivity
- 55% better CCC
- 75% better MAC
- Higher pin count and faster probing possible
- Higher current with same diameter possible

Thank you!