



SWTEST

PROBE TODAY, FOR TOMORROW

2024 CONFERENCE

UNLOCKING SECRETS: Enhancing Semiconductor Testing with Pd-Cu-Ag Alloys



Lea A. Lumper

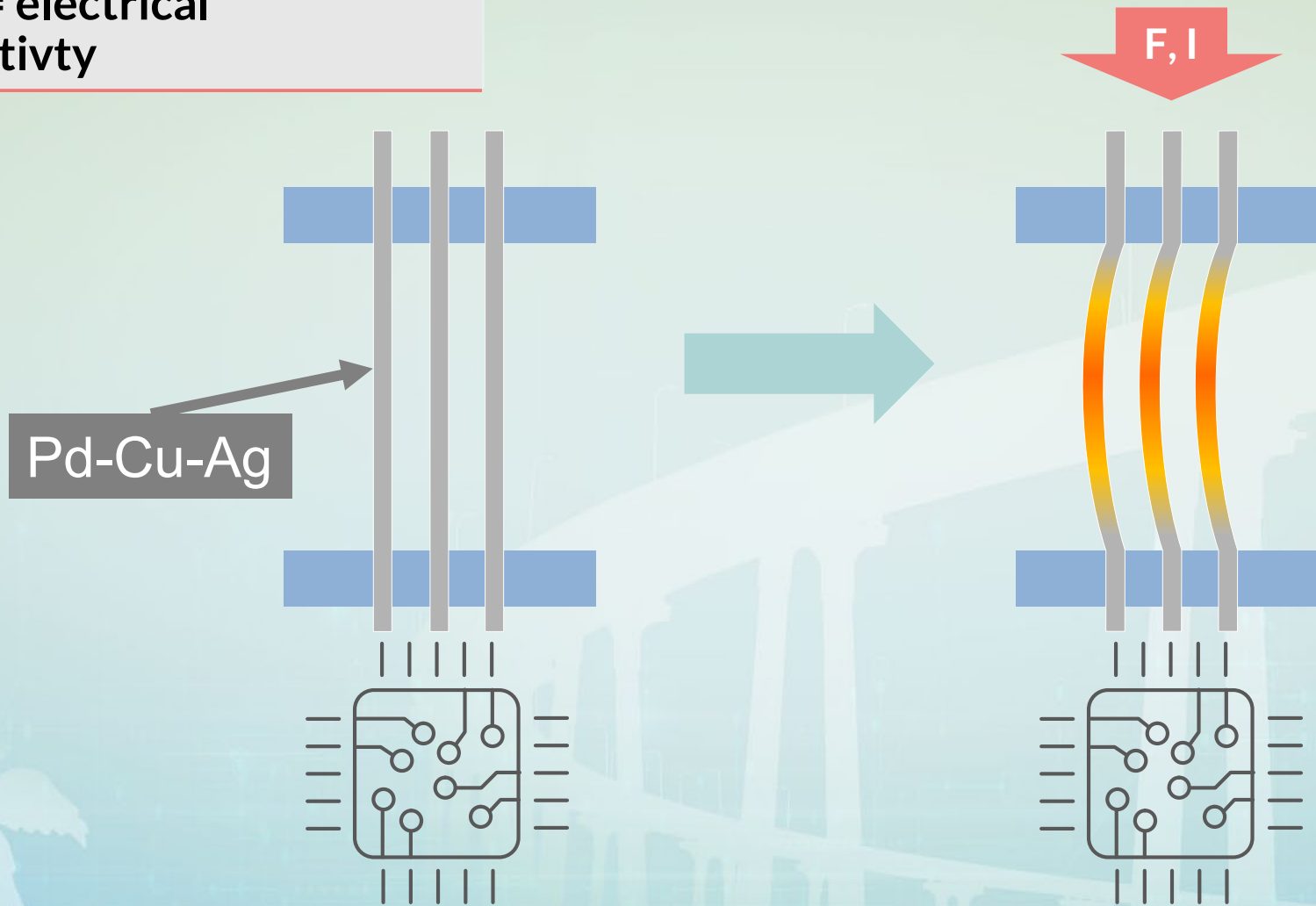
lea.lumper@unileoben.ac.at

Materials Scientist translation:

Force = Strength

Current = electrical
conductivity

Motivation





Leoben

Introduction

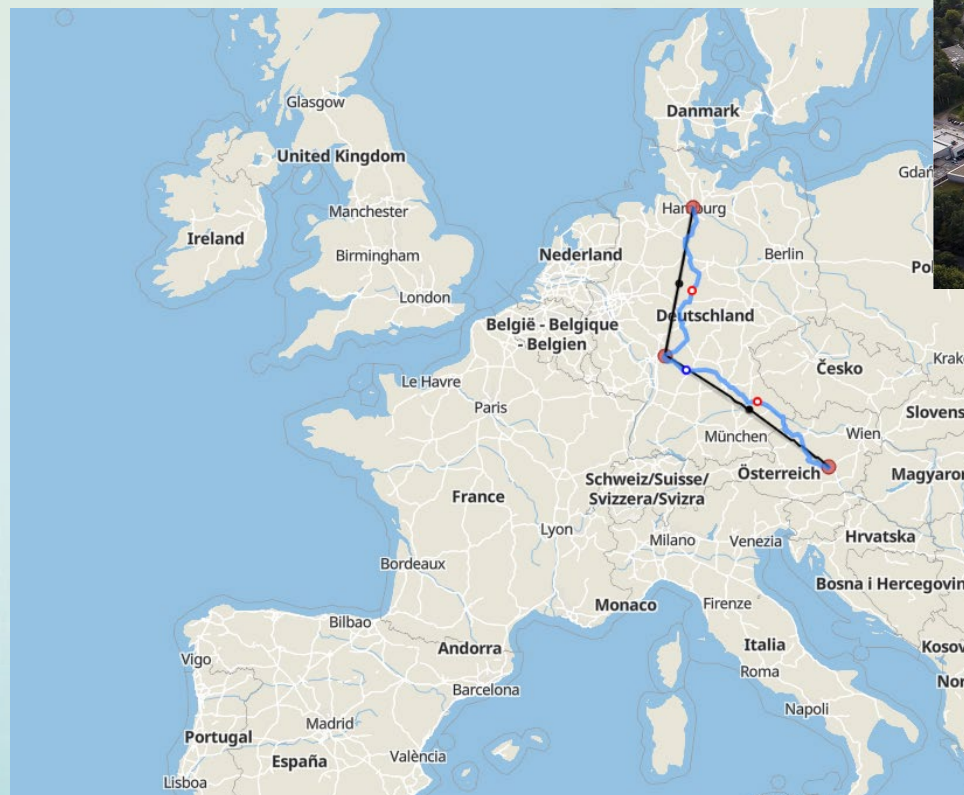
https://photon-science.desy.de/facilities/petra_iii/index_eng.html



Hamburg



LEA LUMPER
and the
SECRETS of
Pd-Cu-Ag



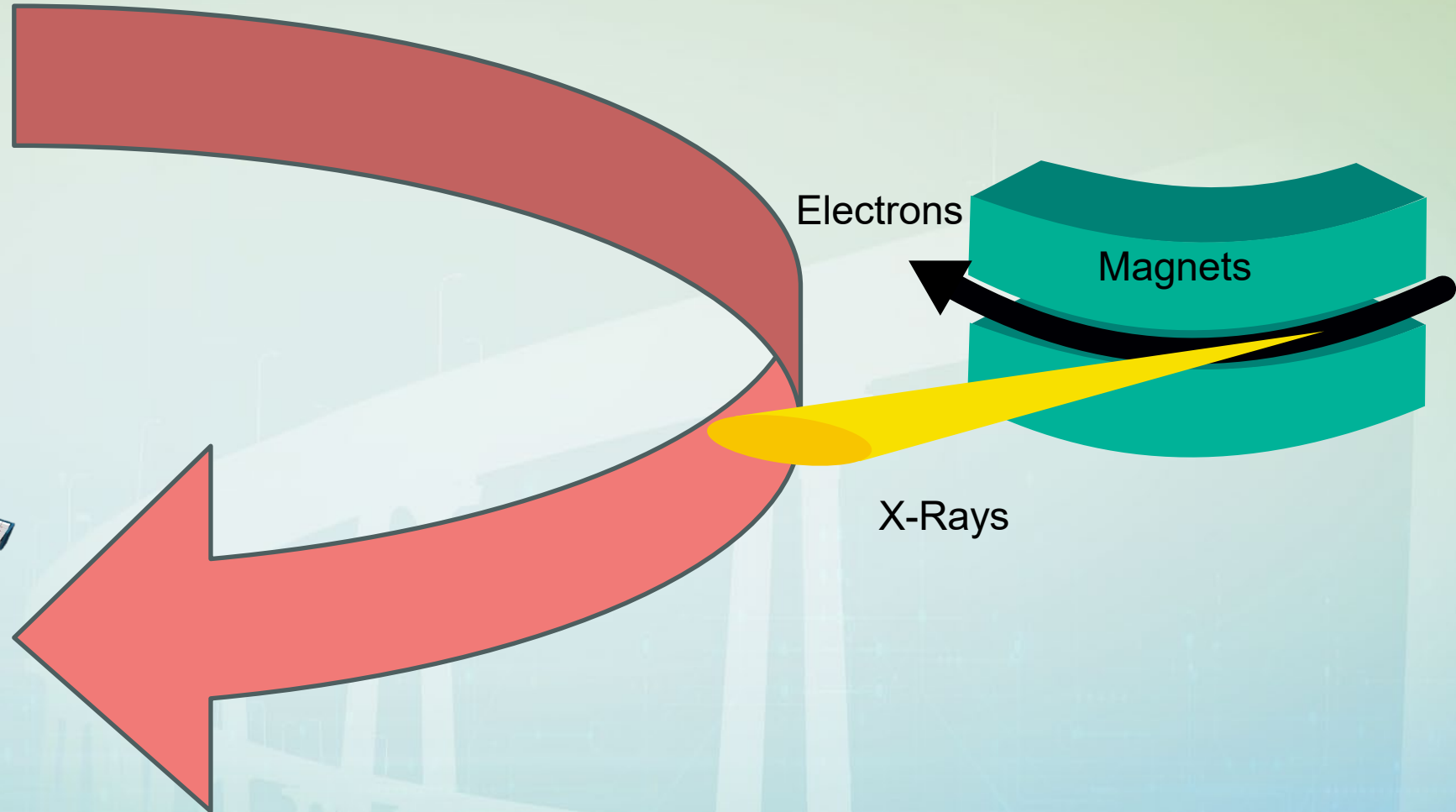
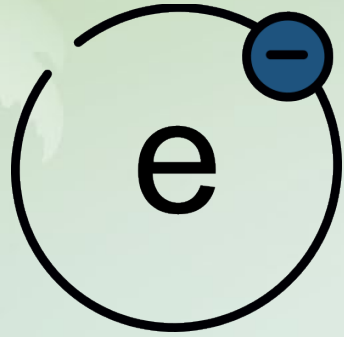
Hanau

Lea A. Lumper
Materials Scientist from Leoben / Austria

SWTest | June 3 – 5, 2024

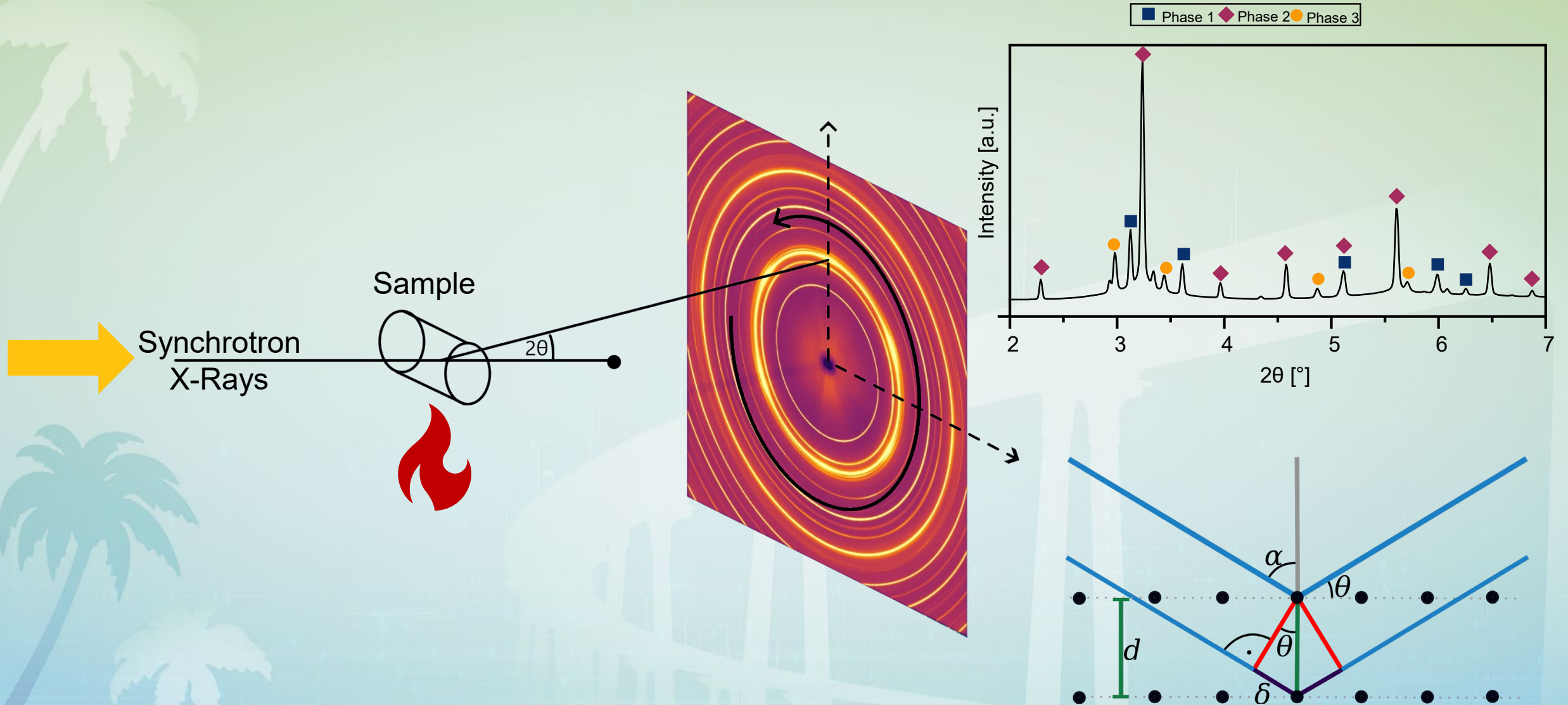
© Heraeus Precious Metals GmbH & Co. KG

Synchrotron Radiation



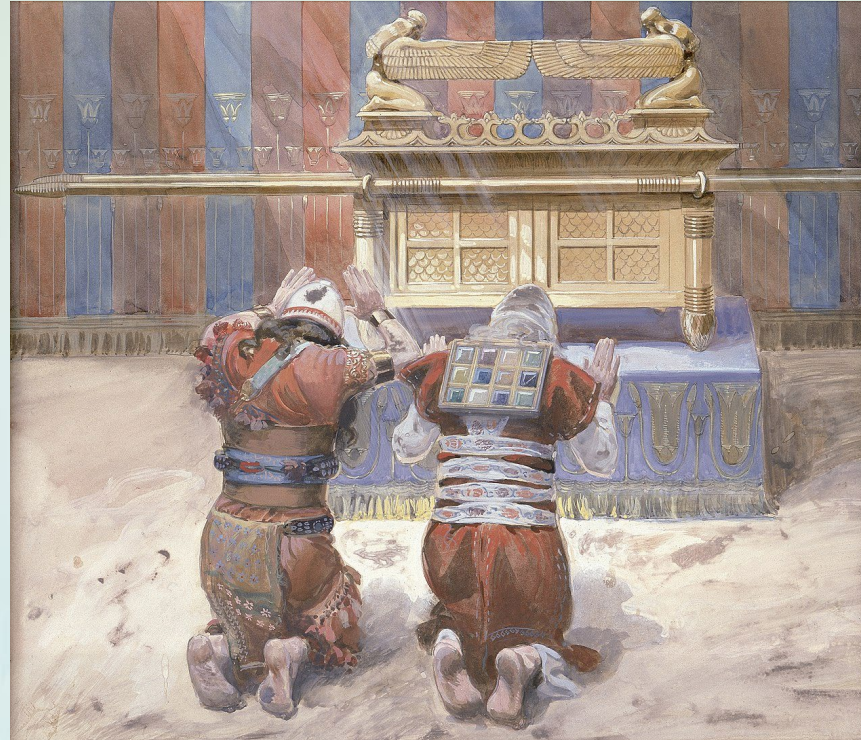
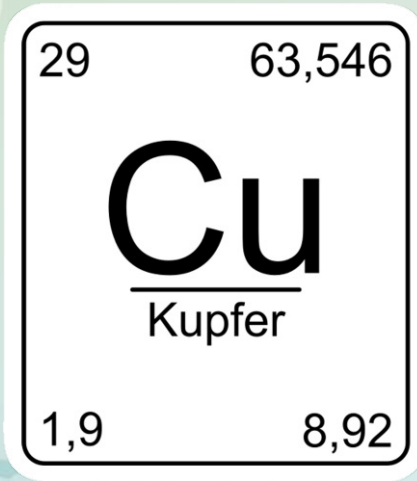
https://de.m.wikipedia.org/wiki/Datei:Sch%C3%A9ma_de_principe_du_synchrotron.jpg

High-Energy X-Ray Diffraction

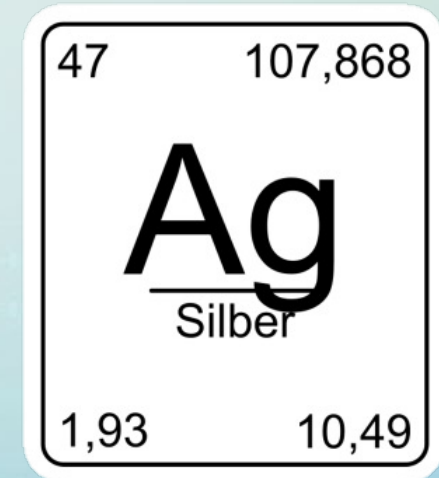
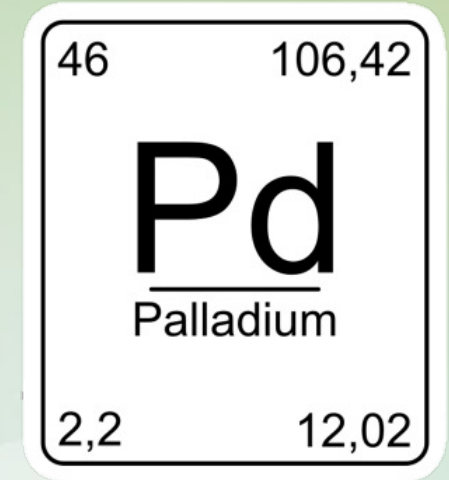


Archeological Artefact

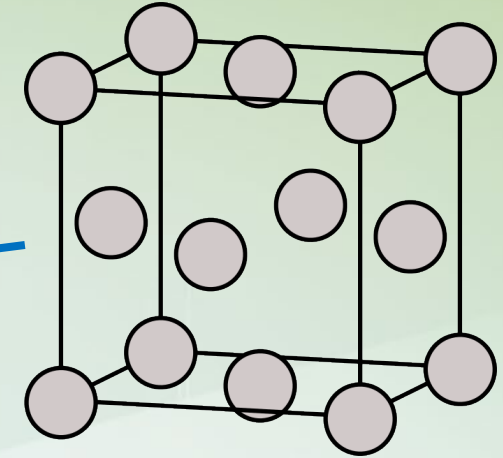
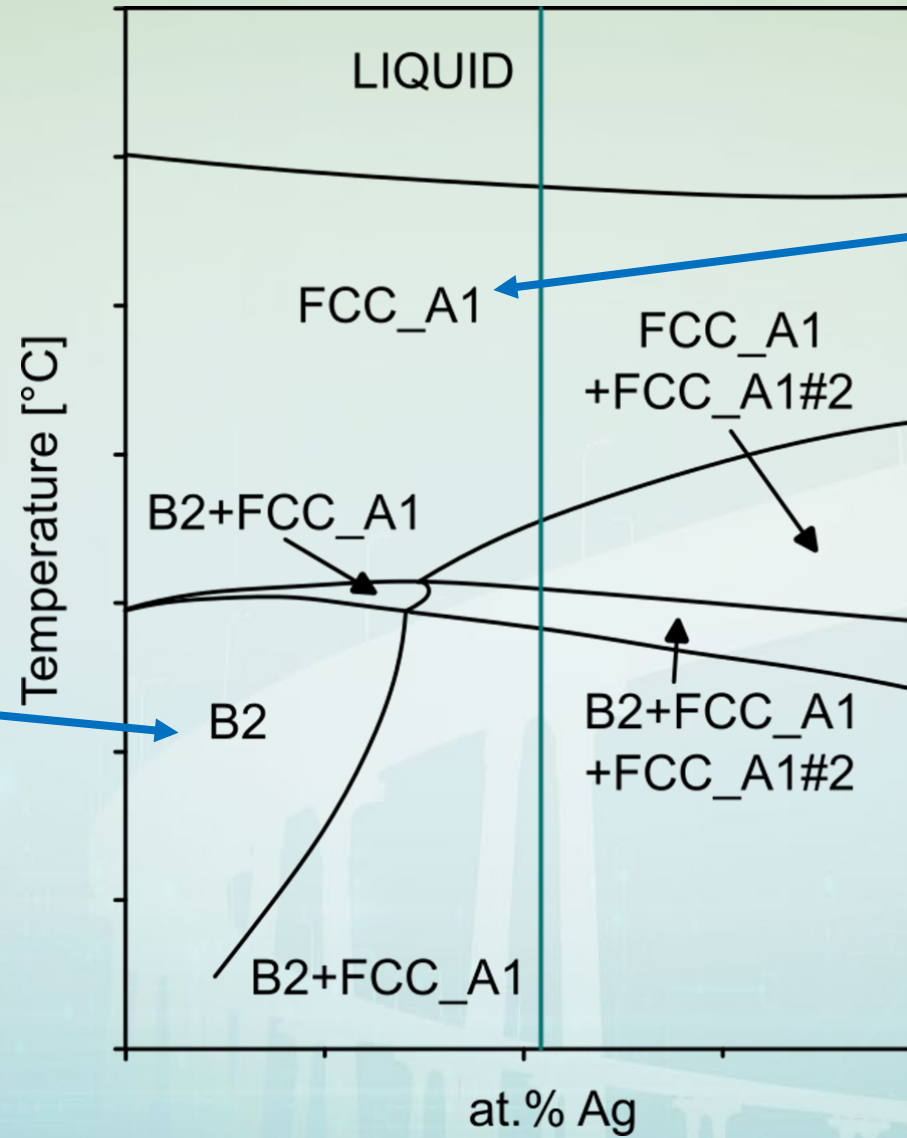
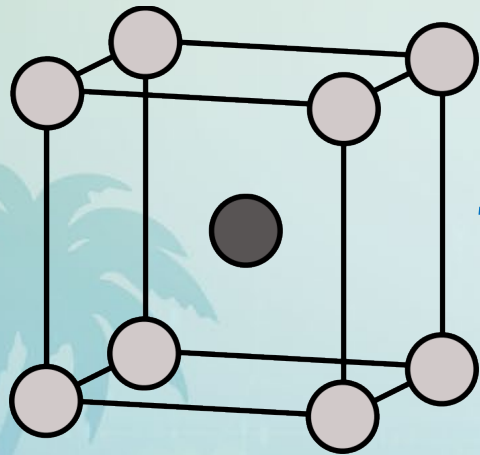
Ark of Covenant



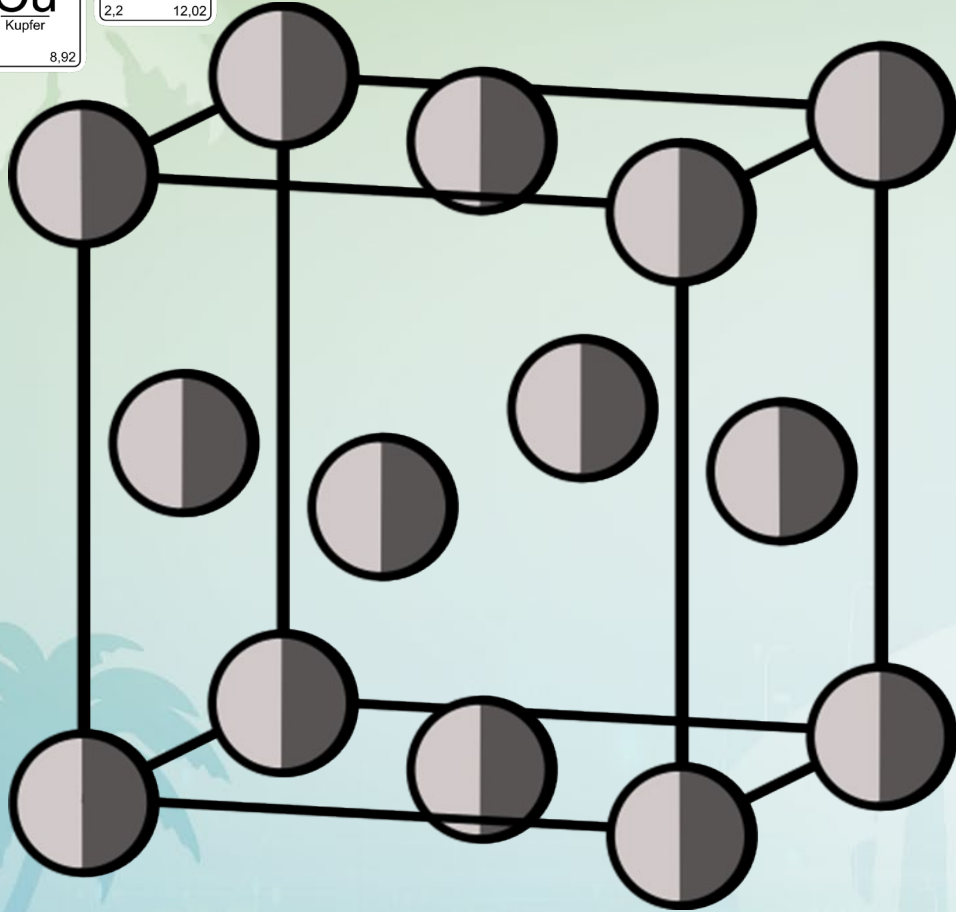
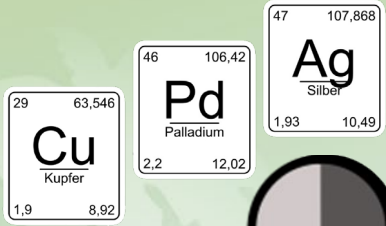
https://en.wikipedia.org/wiki/Ark_of_the_Covenant



Pd-Cu-Ag

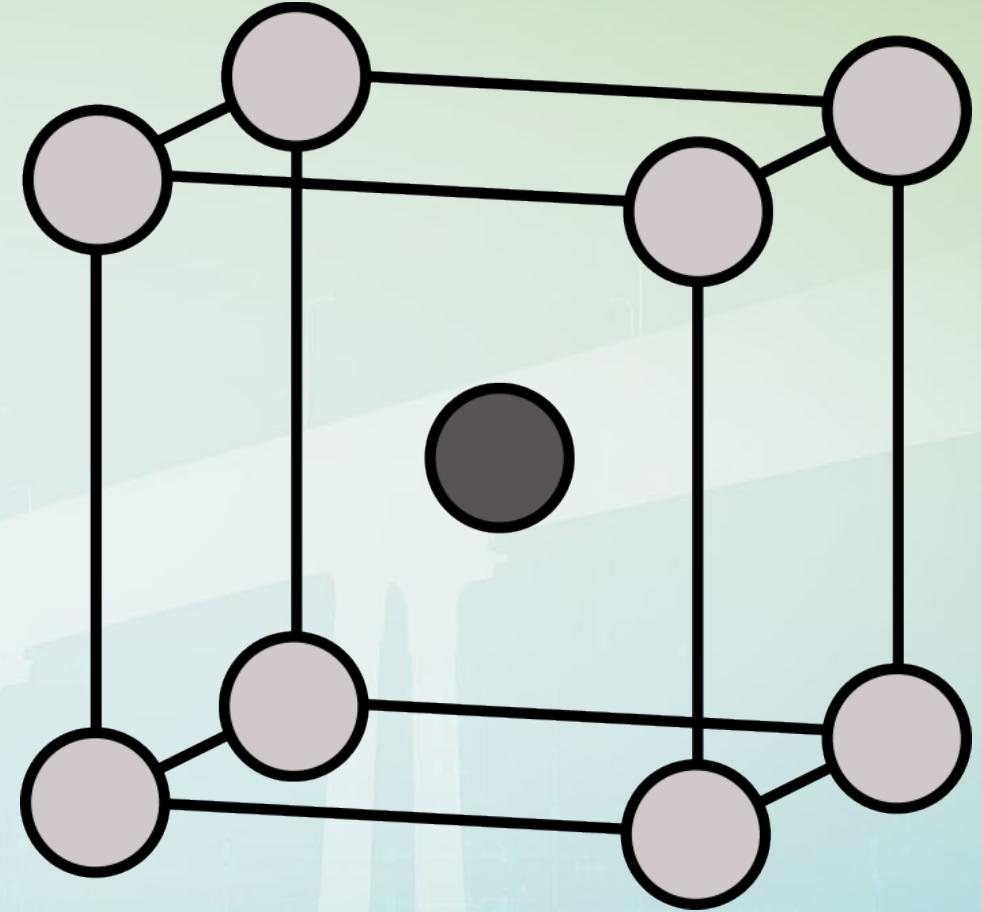


Phases



Solid-solution Unit Cell

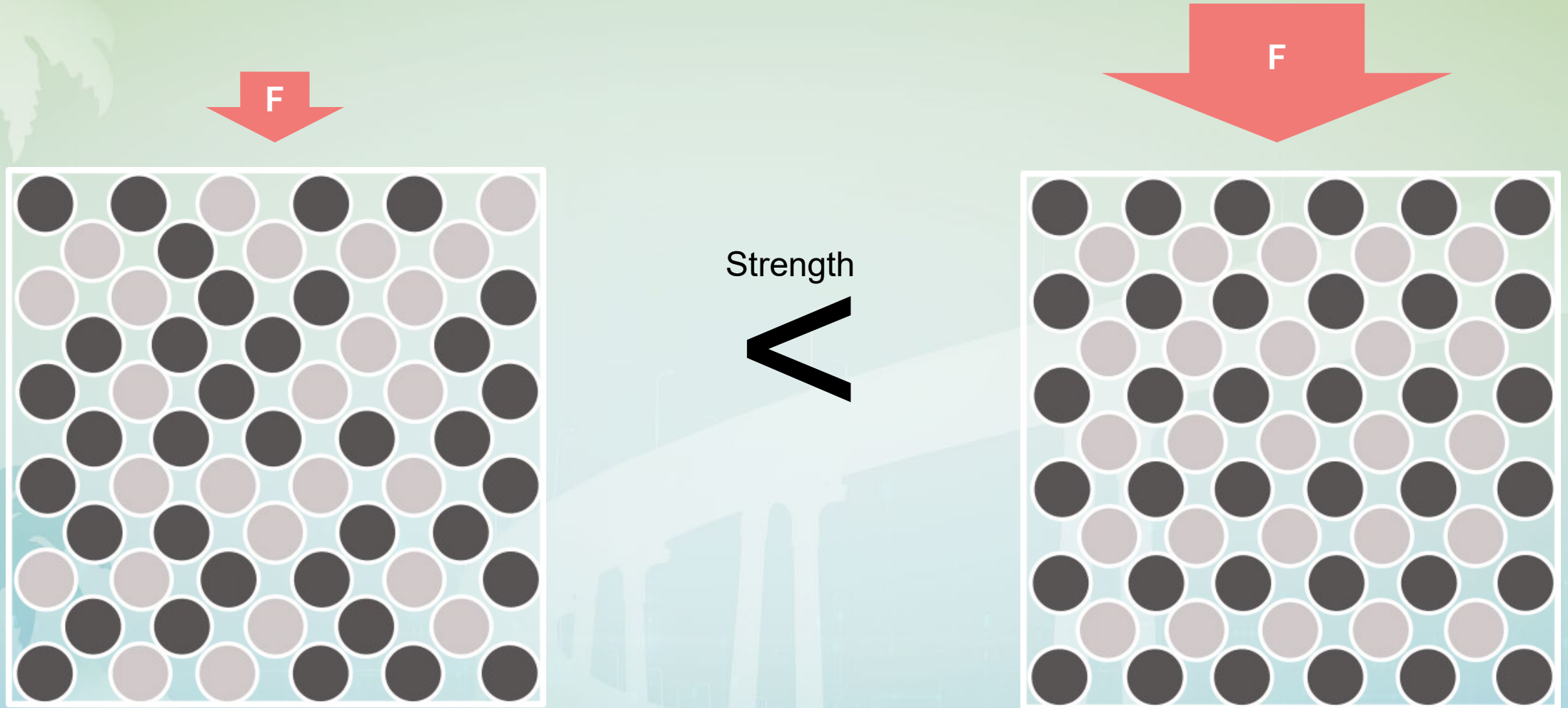
Pd



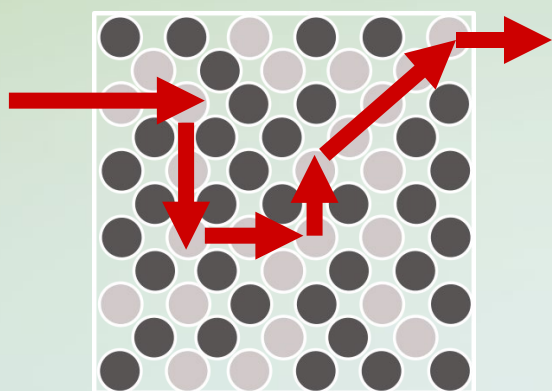
Ordered Unit Cell

CuPd

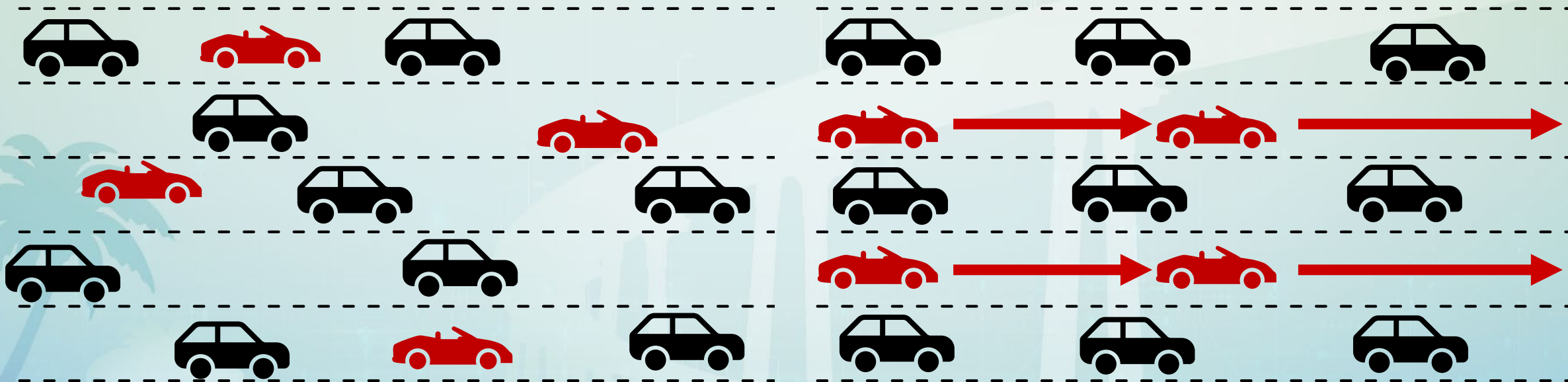
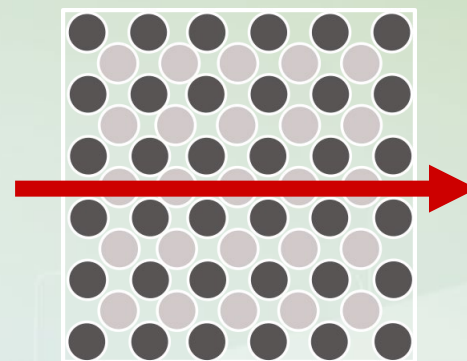
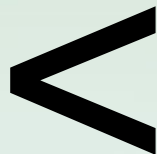
Ordered Phases



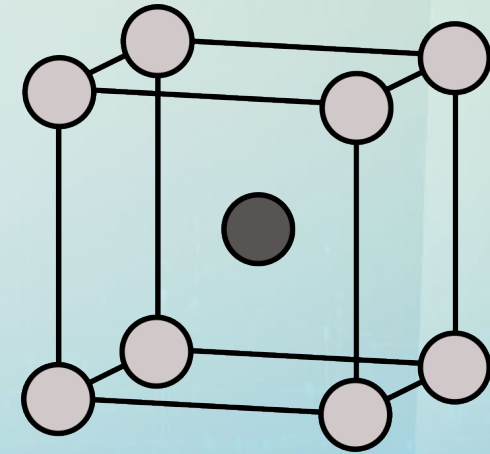
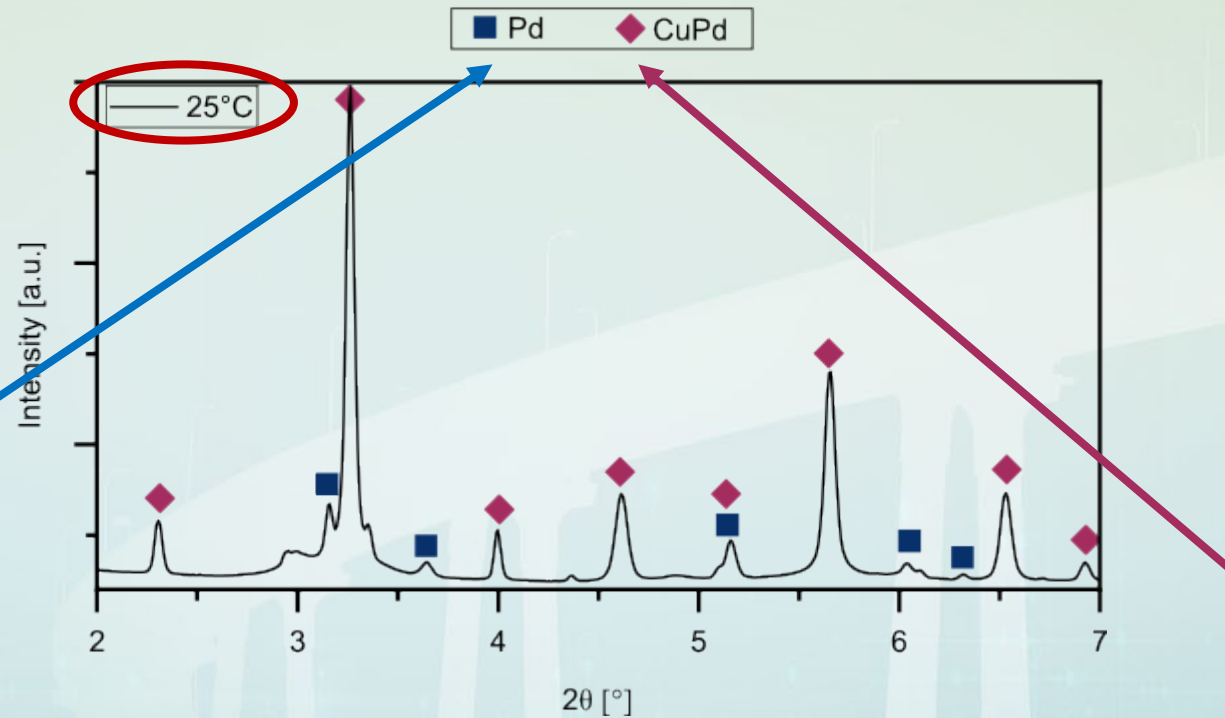
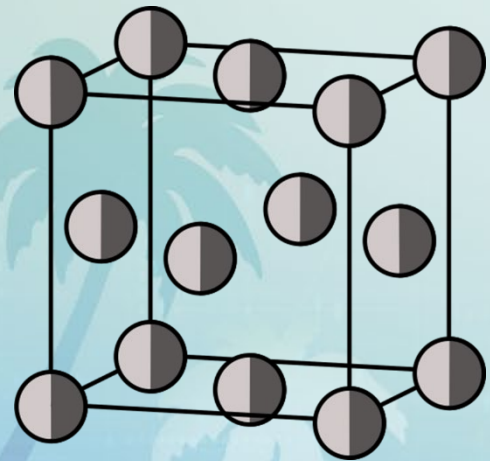
Ordered Phases



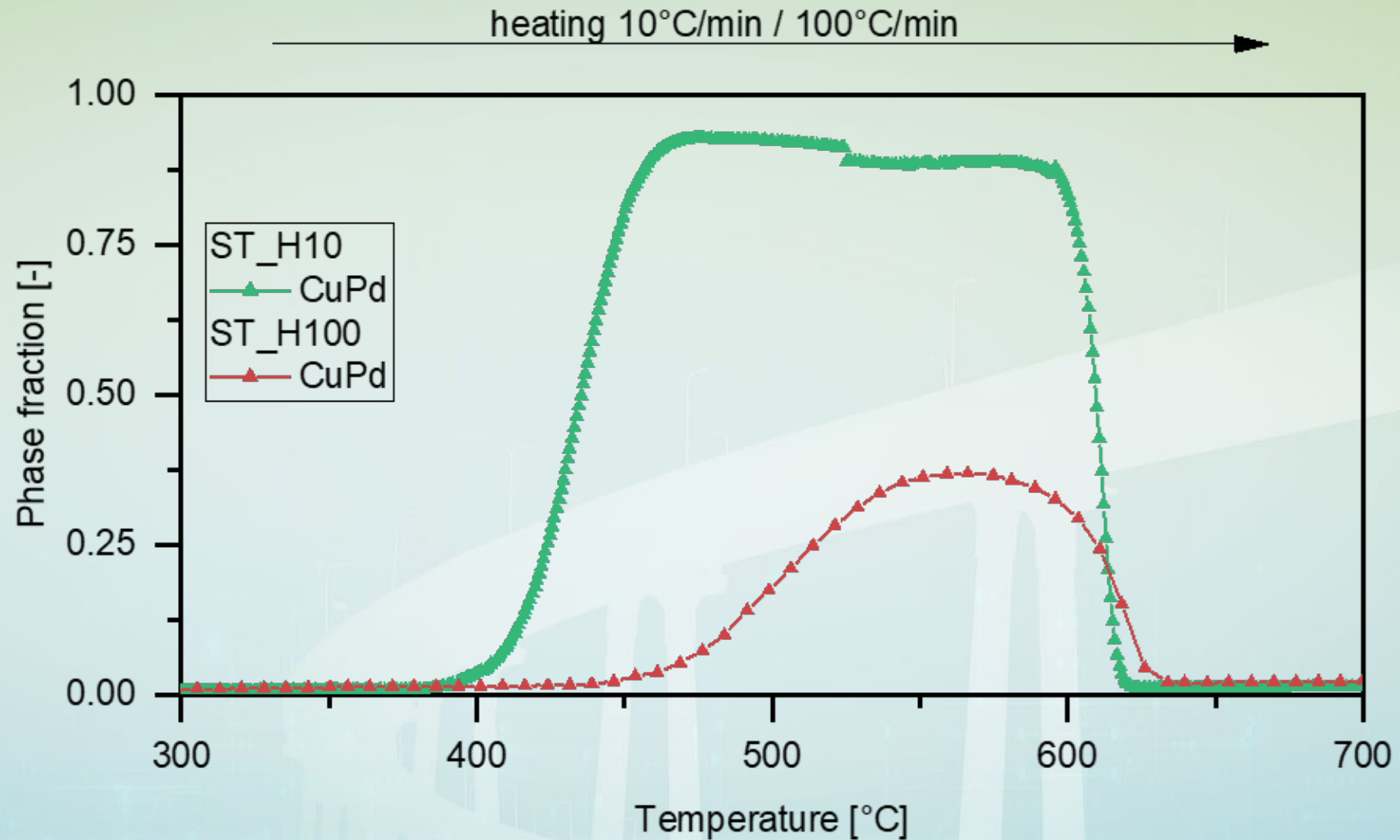
Electrical
conductivity



Uncovering Hidden Treasures

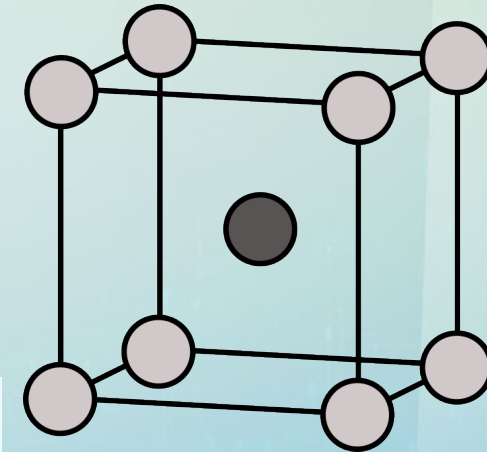
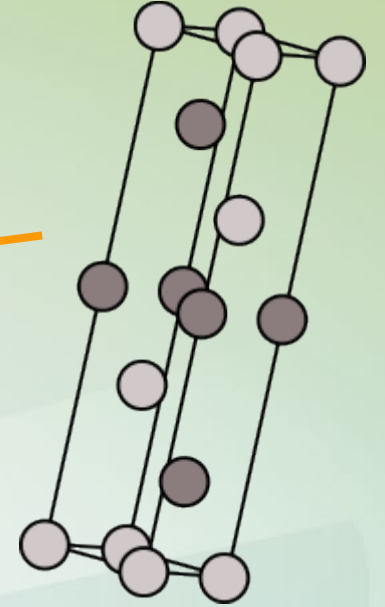
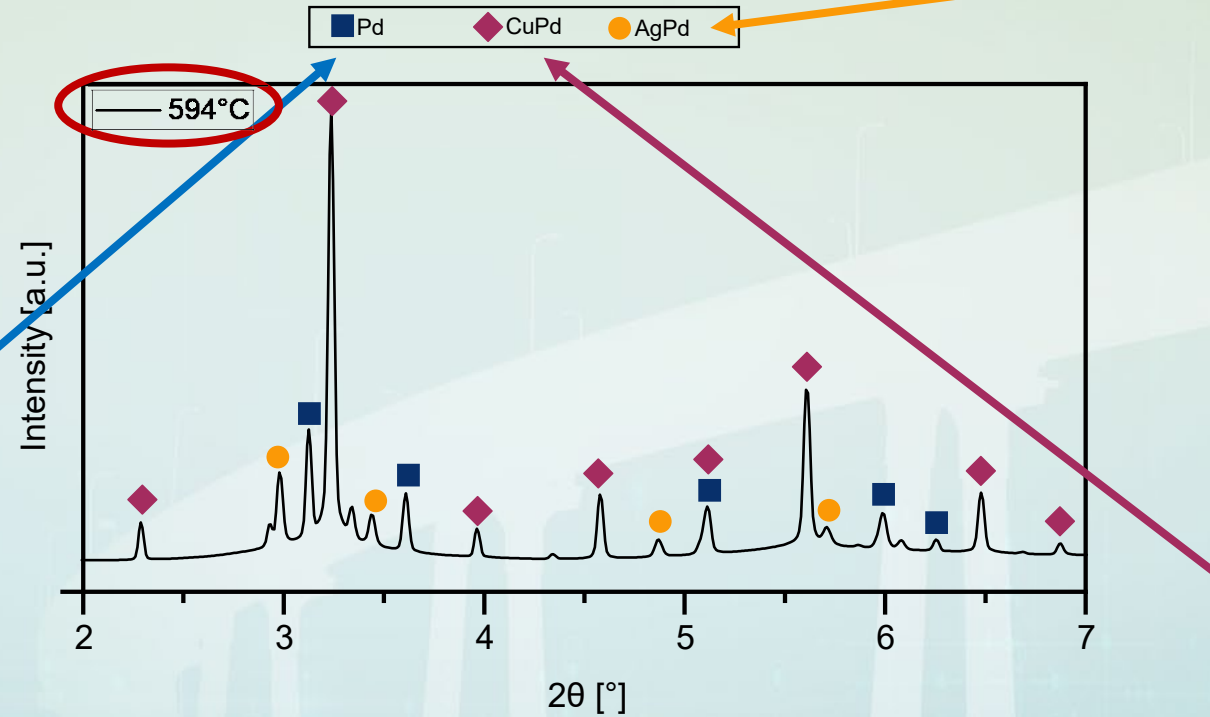
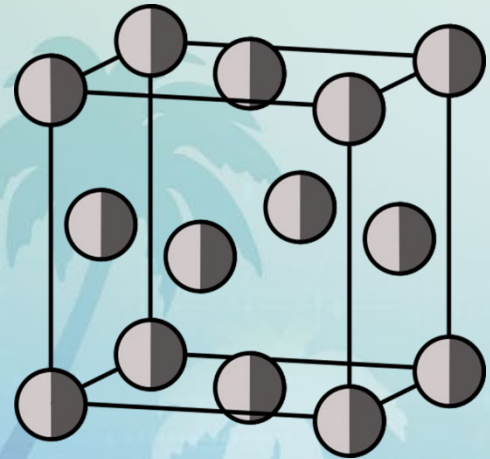


Uncovering Hidden Treasures



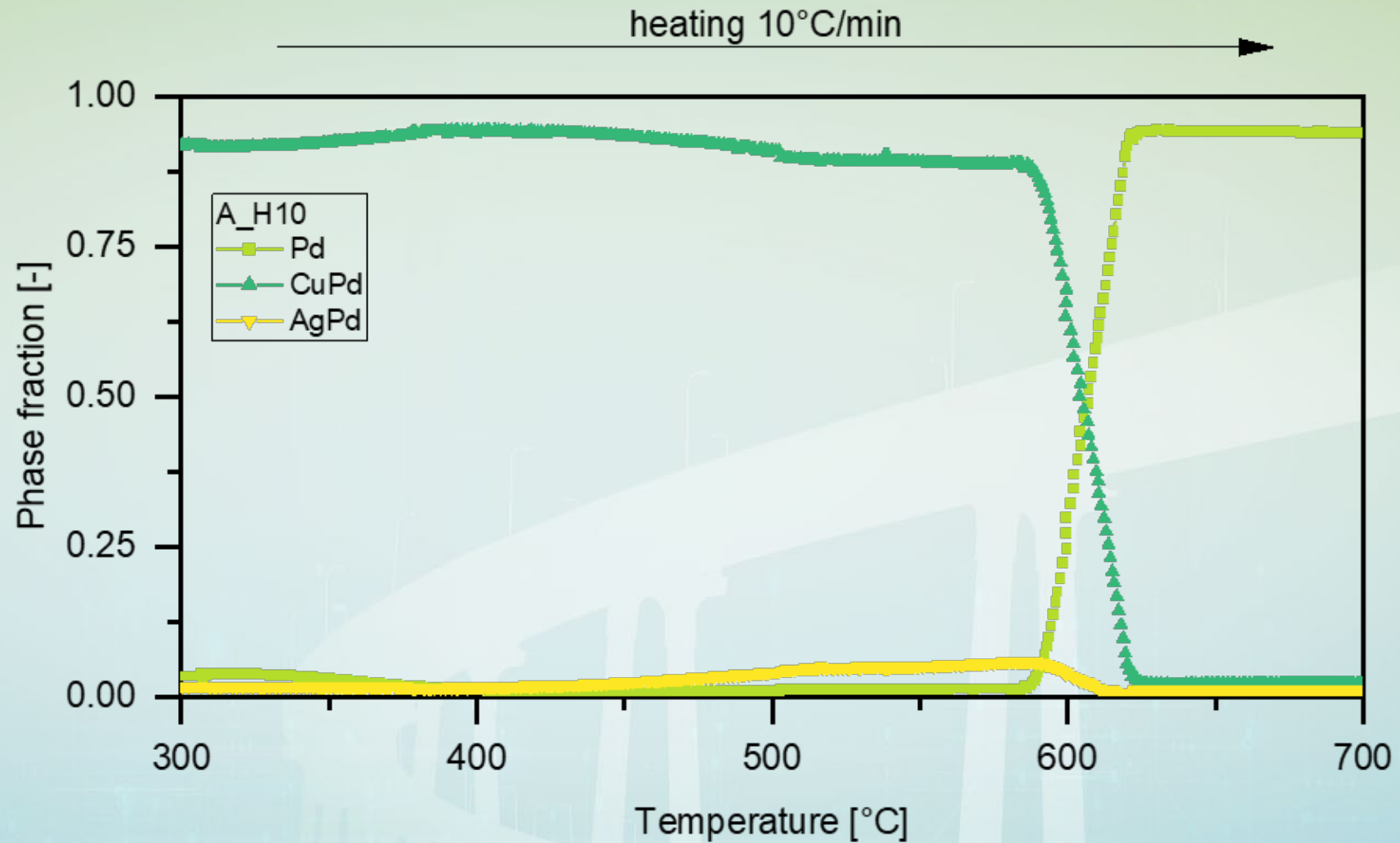
Strong dependence on heating rate

Uncovering Hidden Treasures

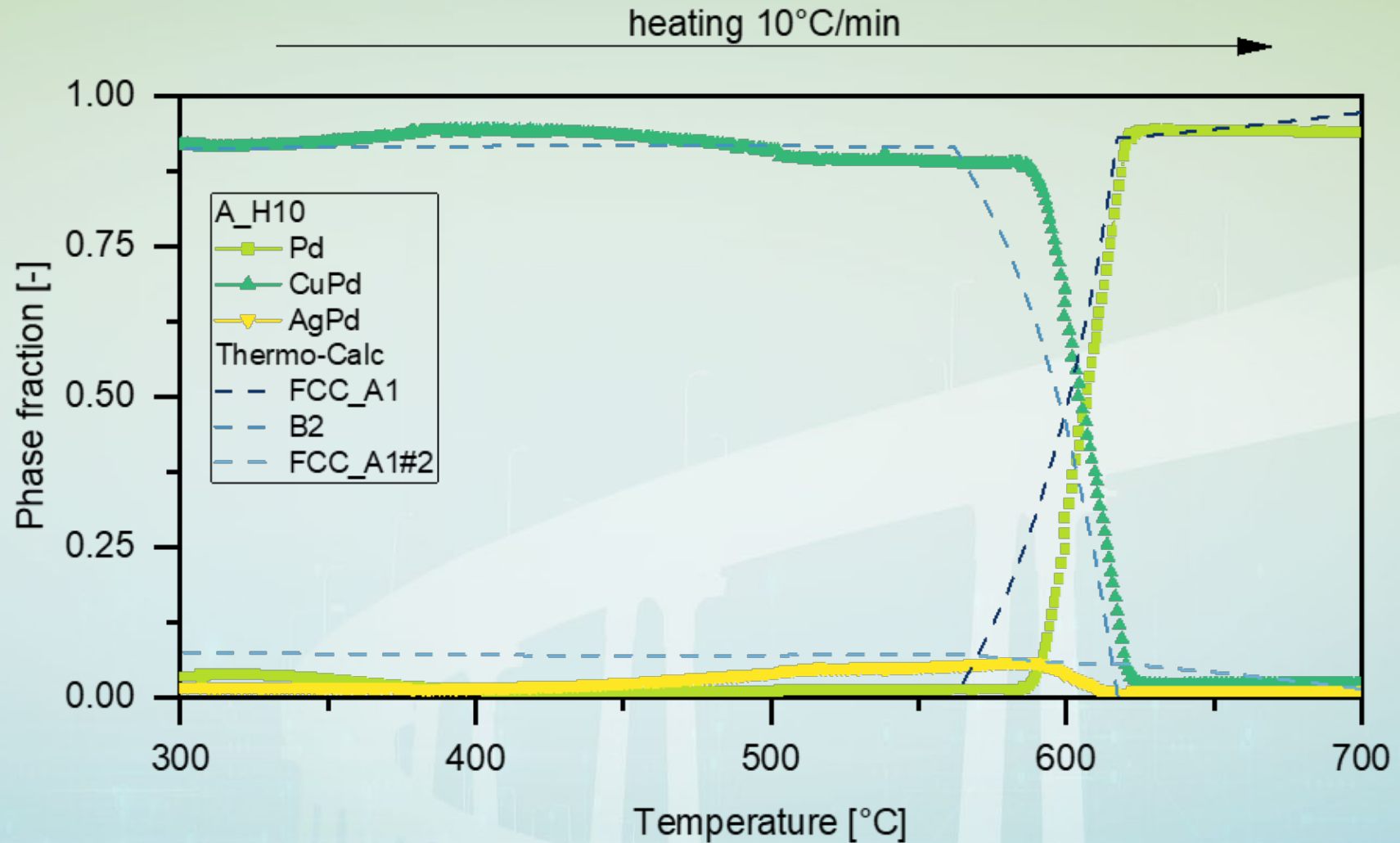


Only visible with high-energy diffraction

Uncovering Hidden Treasures



Uncovering Hidden Treasures

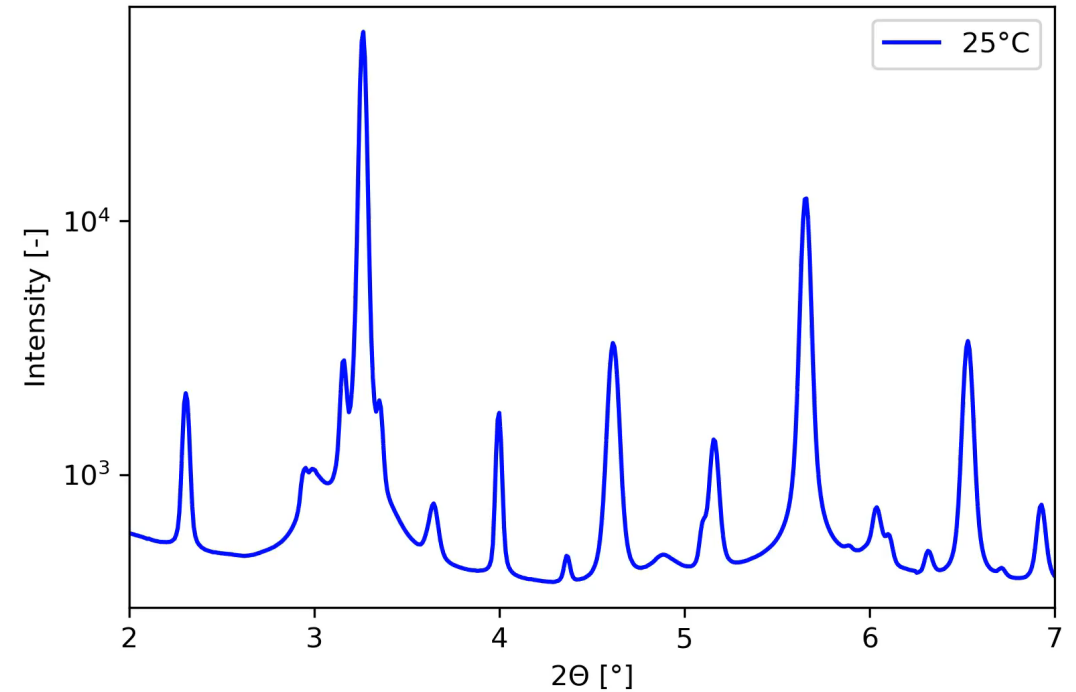
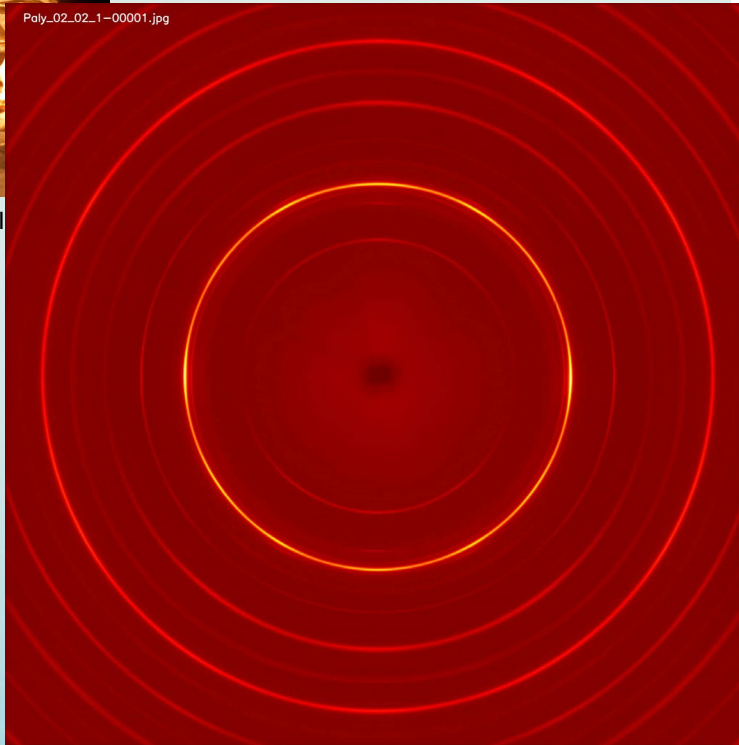


Contradictory to thermodynamic calculations

Uncovering Hidden Treasures



generated via playground.com, an image AI



Challenges and Triumphs:

Influence of:

Heating Rate

Cooling

Thermal
History

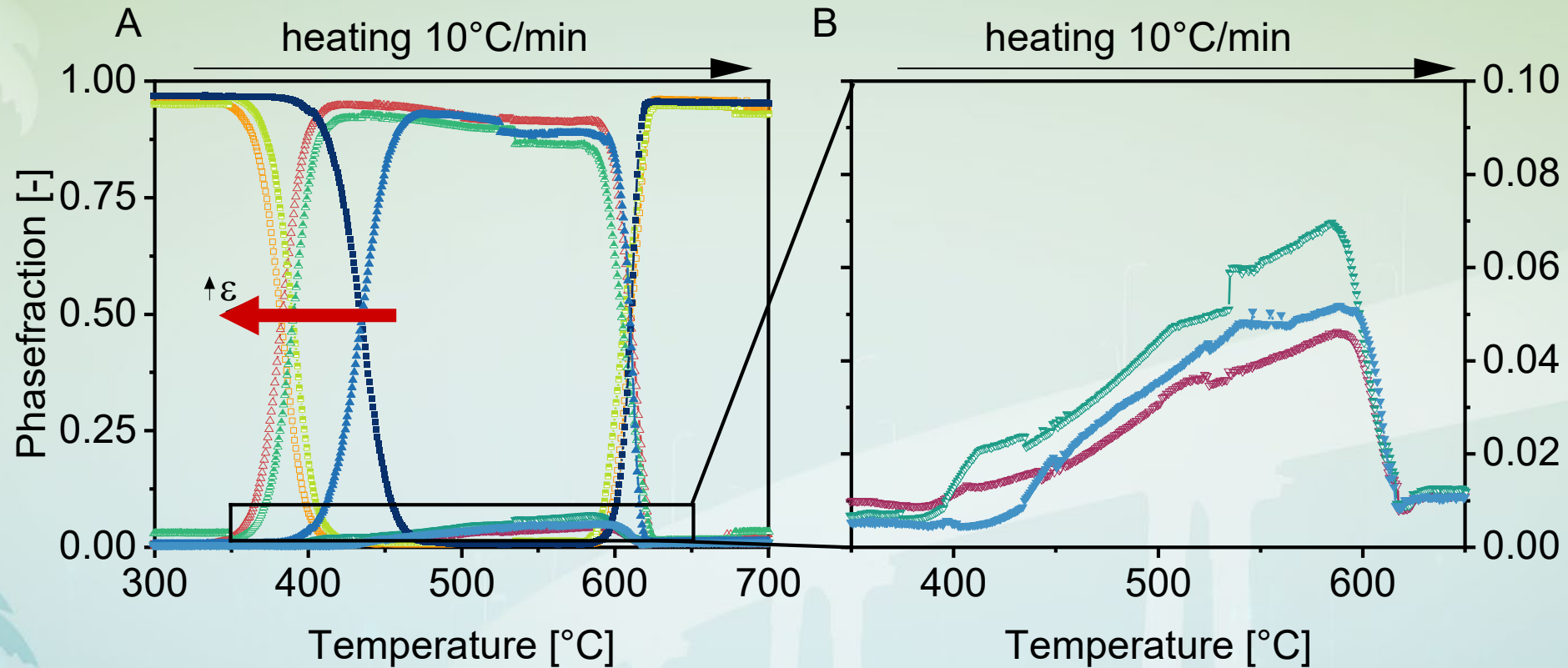
Chemistry

Deformation



generated via playground.com, an image AI

Challenges and Triumphs:

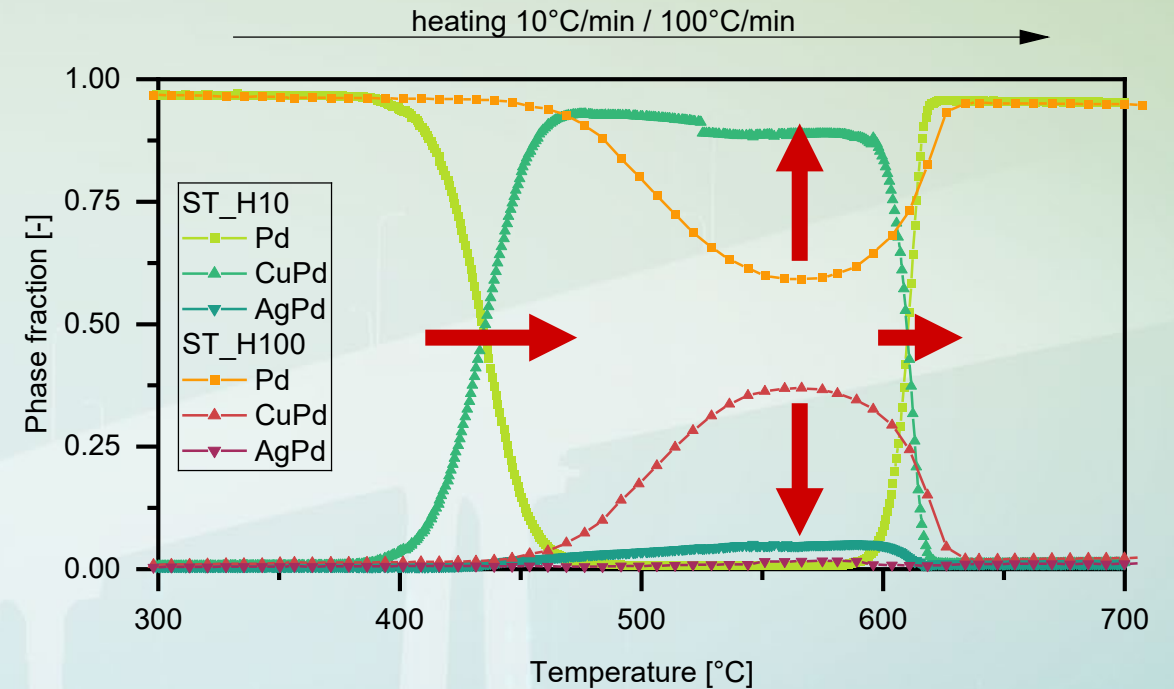
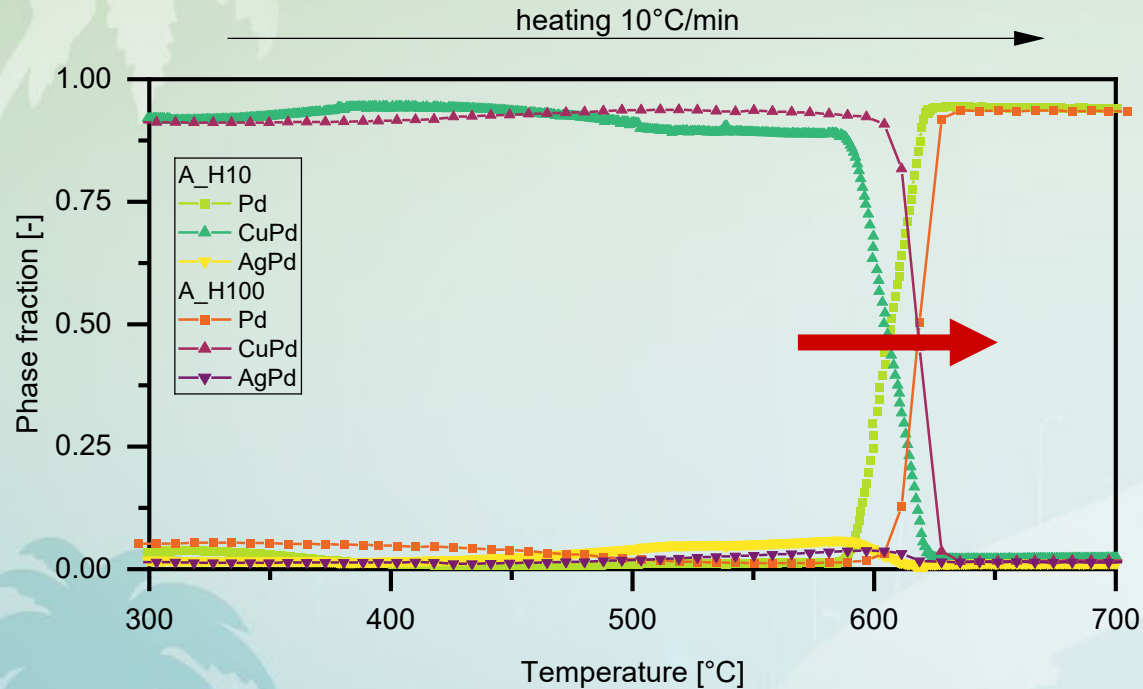


D00_H10 D25_H10 D80_H10

Strong Influence of initial deformation

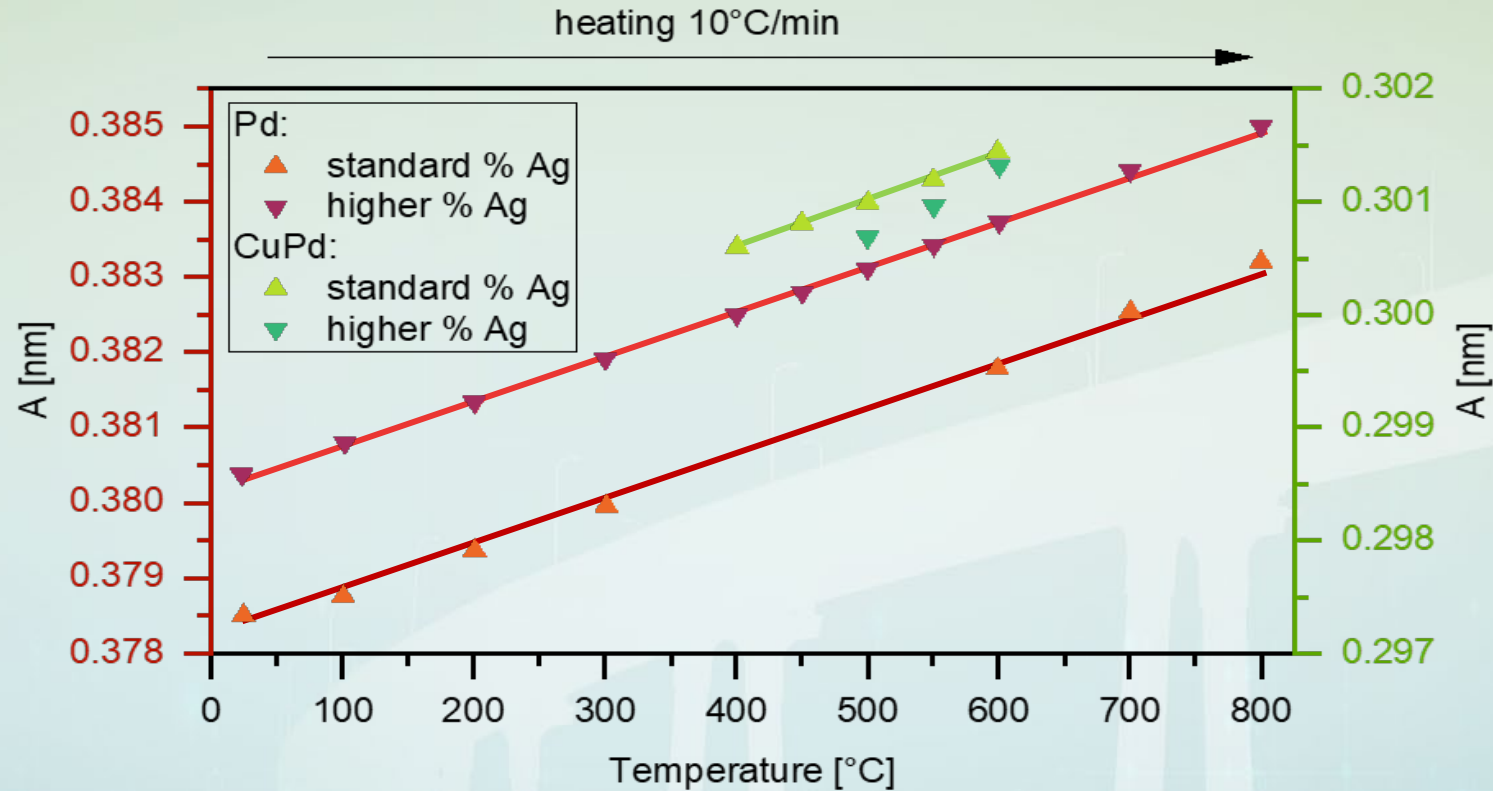
—▼— AgPd —▼— AgPd —▼— AgPd

Challenges and Triumphs:



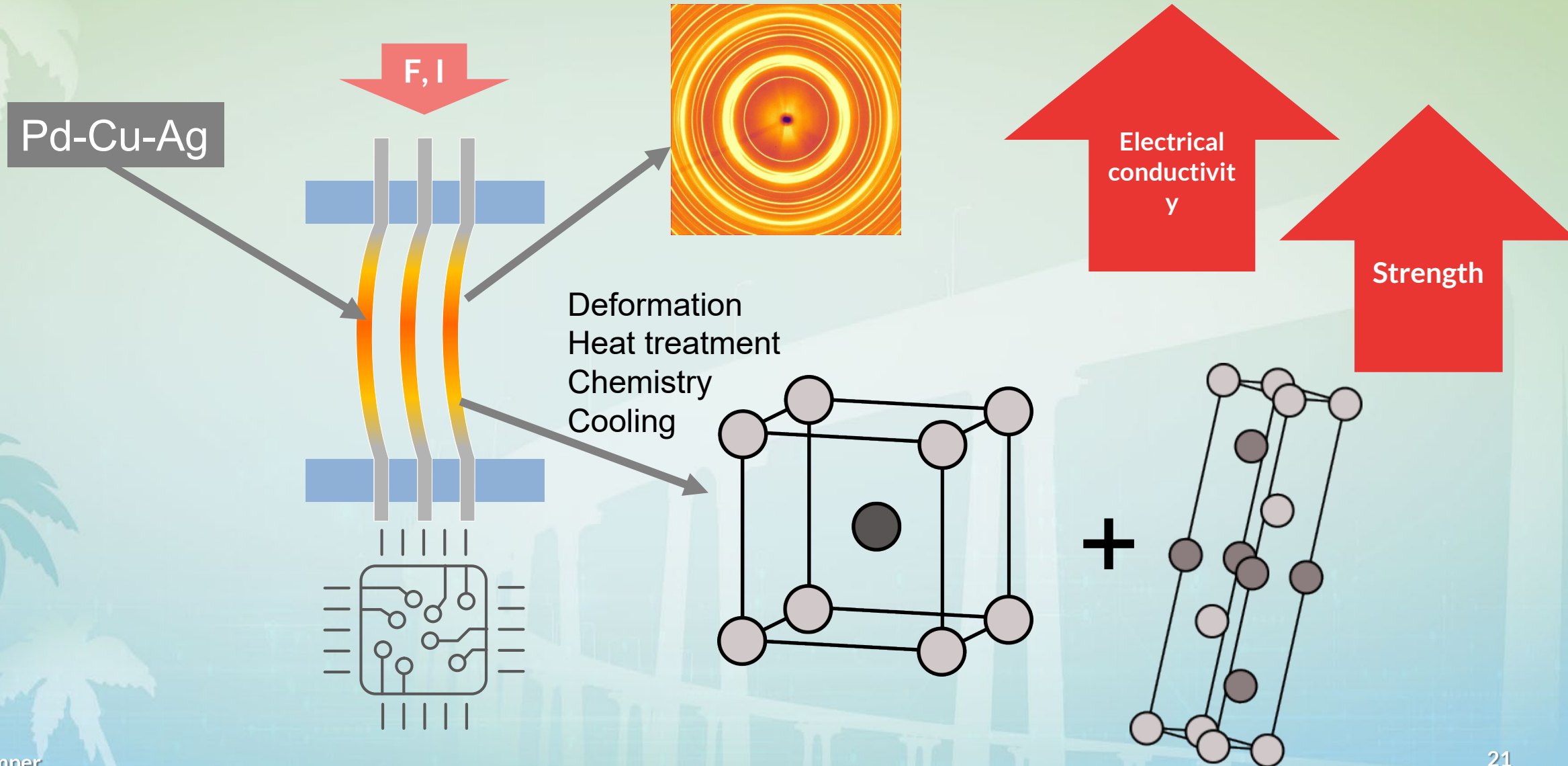
Strong Influence of thermal history & heating rate

Challenges and Triumphs:



Thermal expansion calculatable via synchrotron

Implications and Future Directions



Conclusions

Tailored heat treatments to increase content of CuPd

- Increased strength
- Increased electrical conductivity
- Increase of CCC

Thank You for Your Attention

"I understand its power now." — Indiana Jones



generated via playground.com, an image

