

W-laminates for structural divertor applications: W-Ti laminates

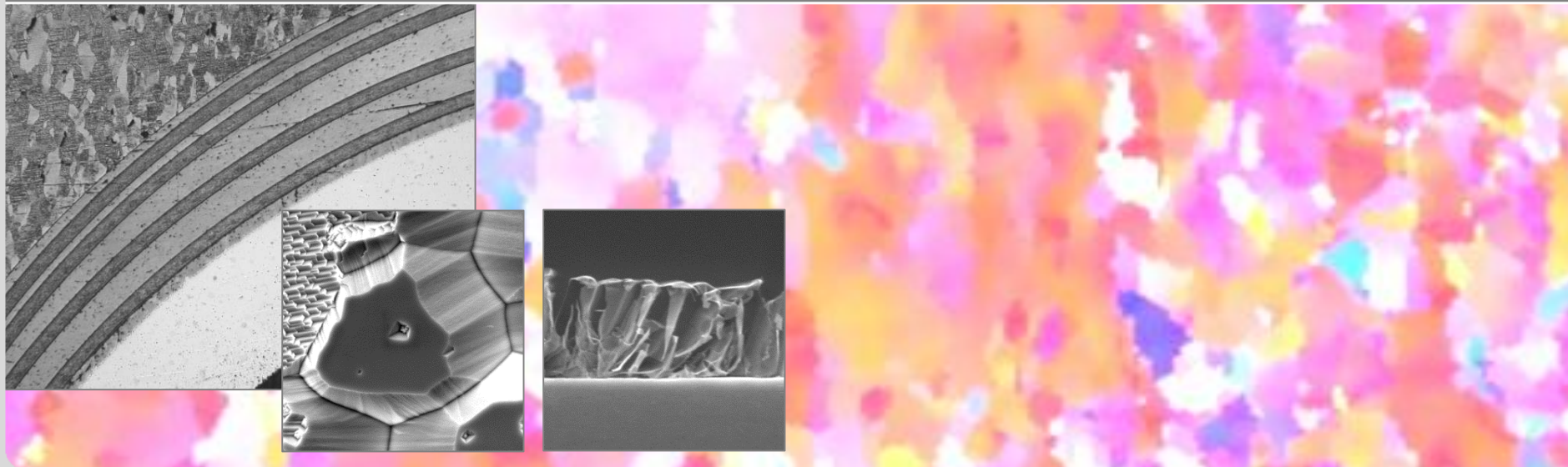
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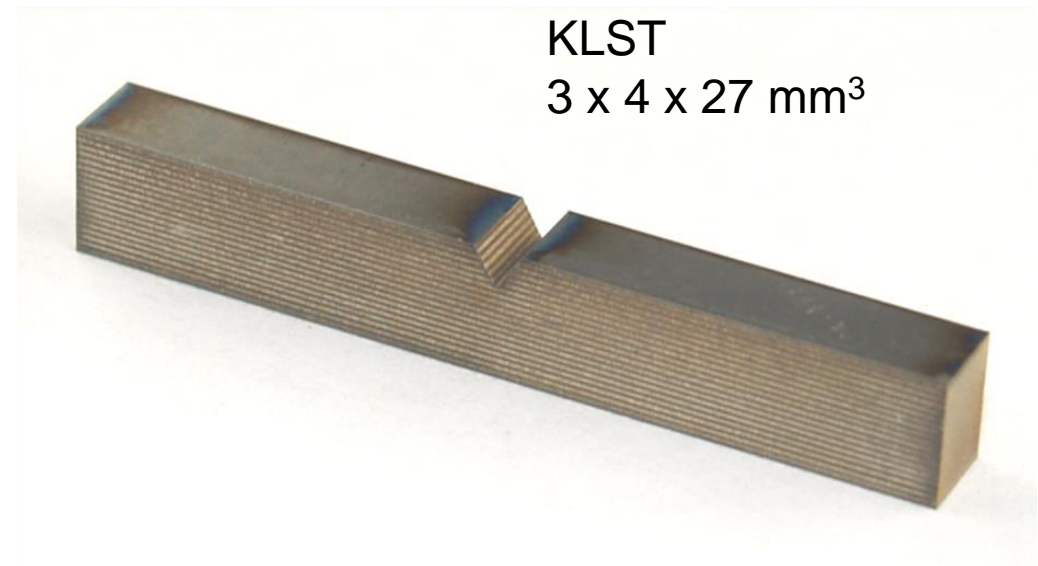
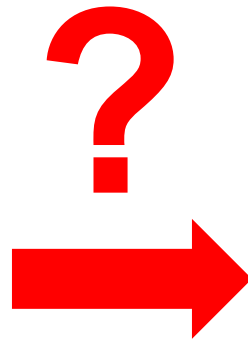
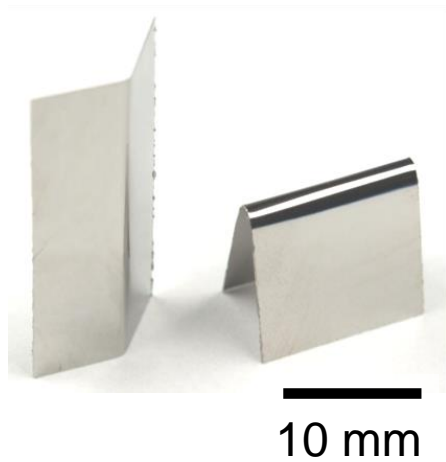
Content

- W-Ti laminates
 - Charpy
 - SEM
 - Auger

- Outlook: 1000 h / 1000°C

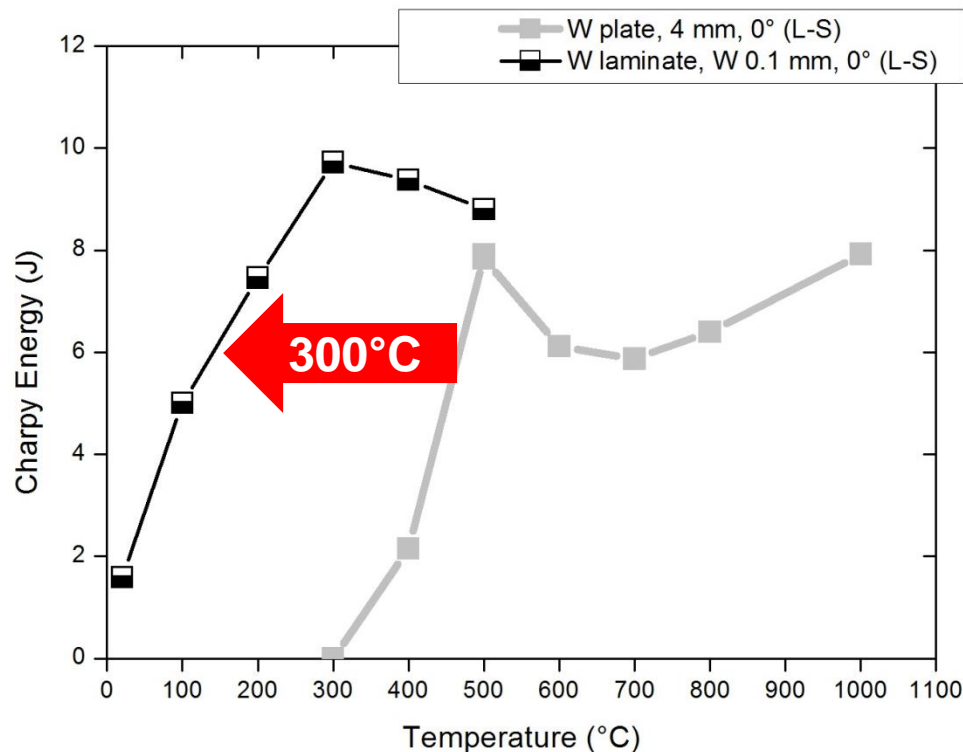
Main question

- Is it possible to expand the ductile properties of a W-foil to the bulk?



W-laminates: Charpy impact tests

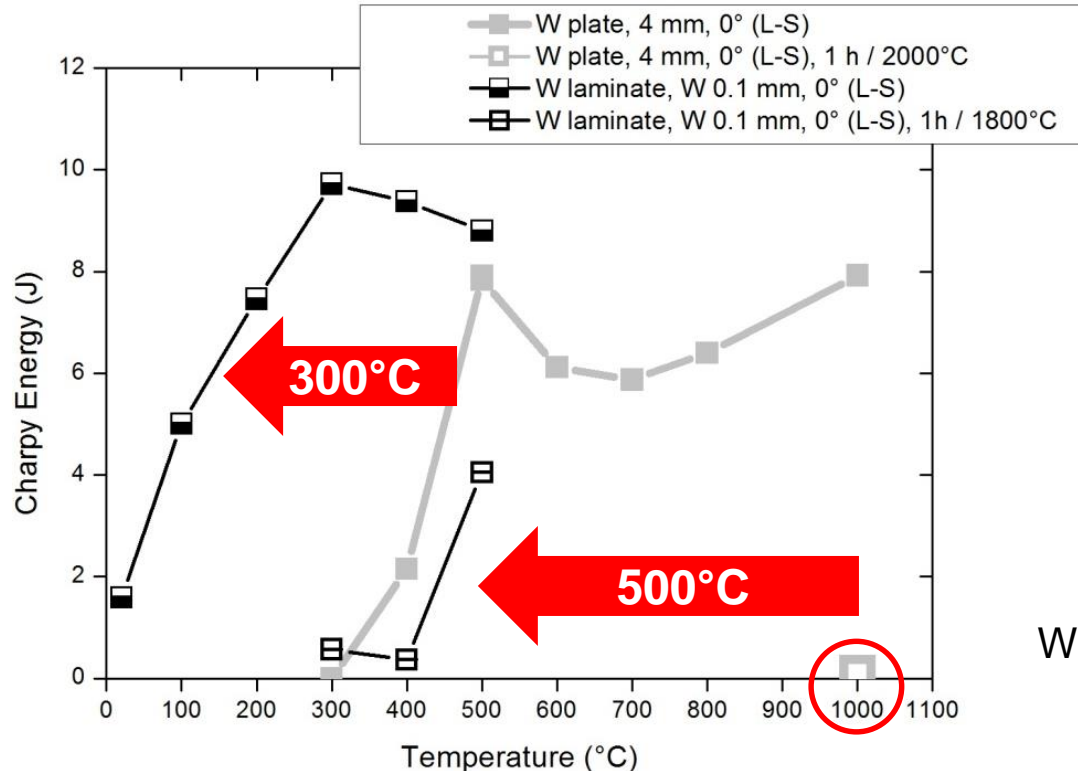
- Can the ductile properties of a W-foil be transferred to the bulk?
 - As-received: improvement of 300°C



W-laminate made of AgCu

W-laminates: Charpy impact tests

- Can the ductile properties of a W-foil be transferred to the bulk?
 - As-received: improvement of 300°C
 - Recrystallized: improvement of 500°C

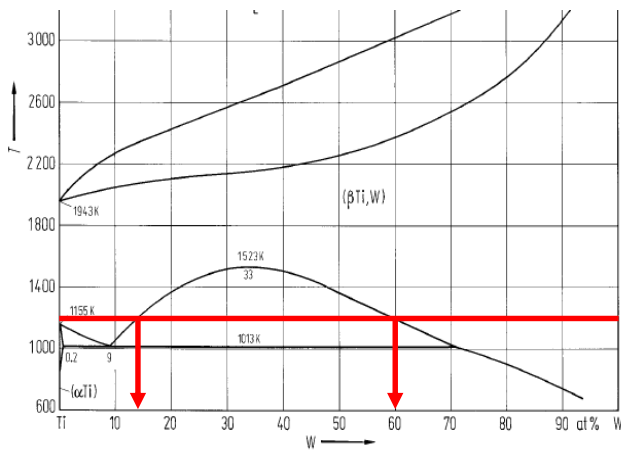


W-laminate made of AgCu

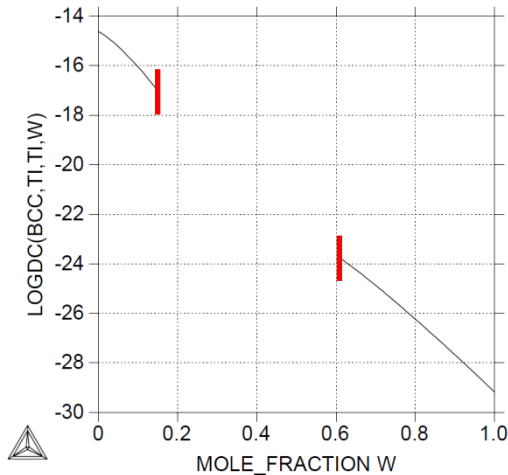
W-laminates: diffusion bonding with Ti

W-Ti diffusion bonding at 900°C

W-Ti phase diagram

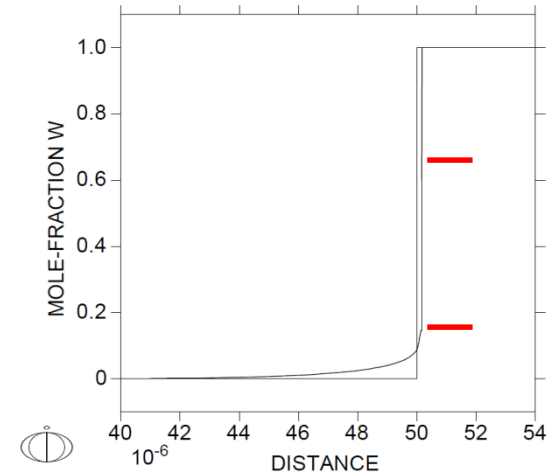


(inter-) diffusion coefficients at 900°C



P. Franke (KIT)

Interface, 900°C:
0 s, 1 h



P. Franke (KIT)

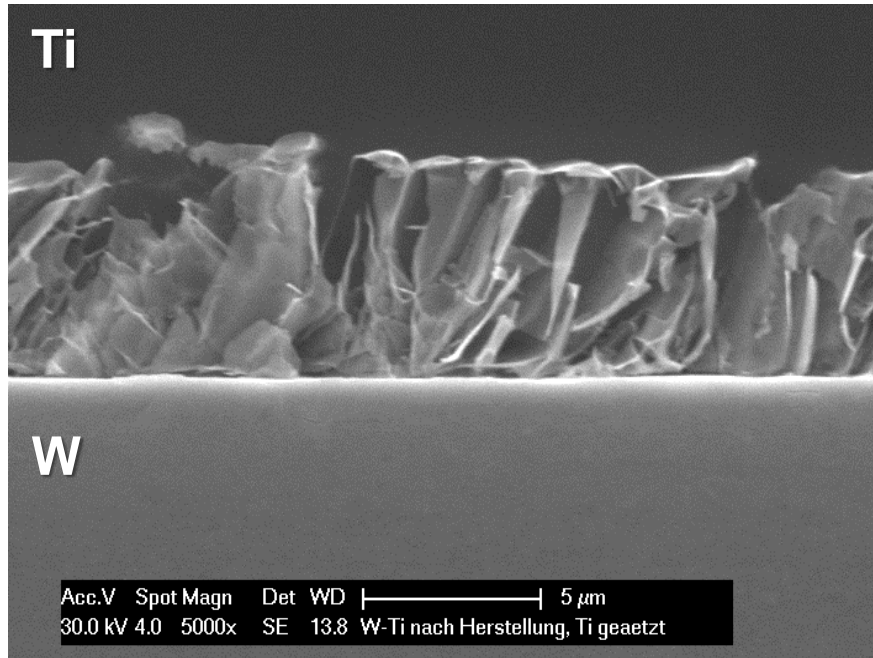
2 solid solutions after cooling down

Diffusion: W in Ti > Ti in W

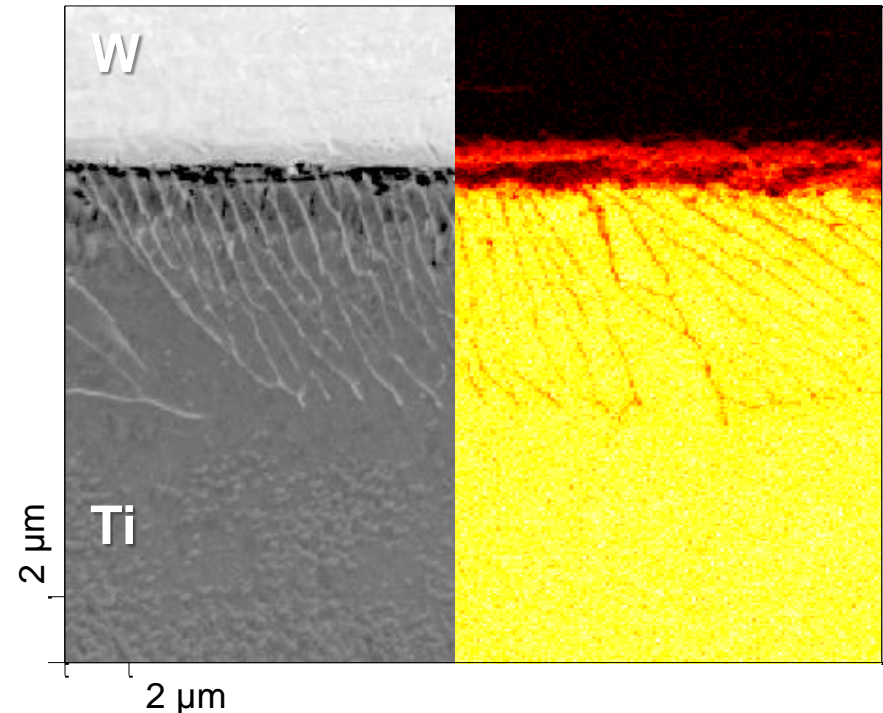
Phase boundaries
Miscibility gap

W-laminates: diffusion bonding with Ti

- W-Ti diffusion bonding at 900°C → cooling down at RT



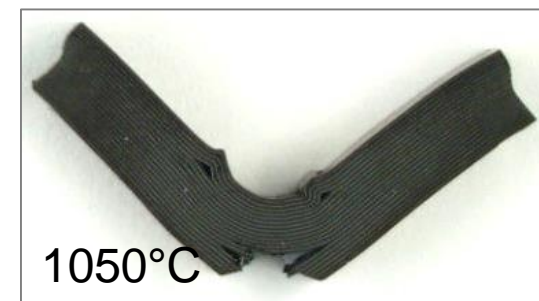
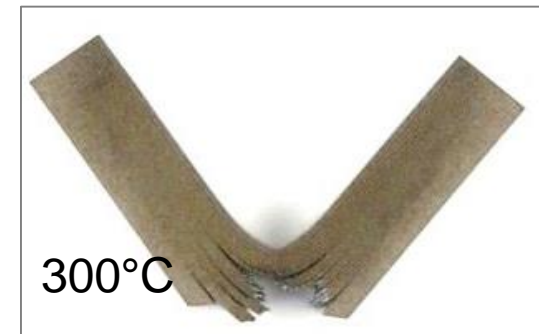
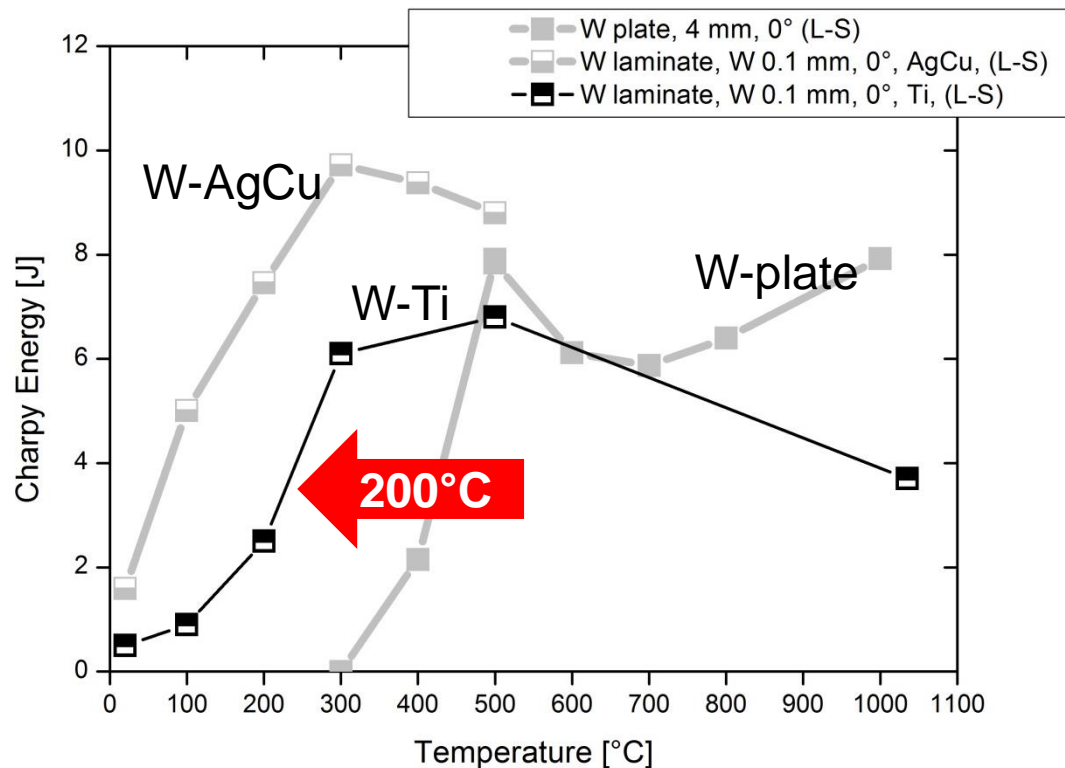
- Eutectoid transformation
- WIDMANSTÄTTEN-kind structure
- W needles in α -Ti matrix



- Quantitative scale of Ti: yellow = max., black = min.

W-laminates: diffusion bonding with Ti

- Charpy impact properties
 - Improvement of 200°C compared to W-plate material



Thank you for your attention

The authors are grateful to

