

Nanobubbles and Nanocavities in Palladium as a function of He

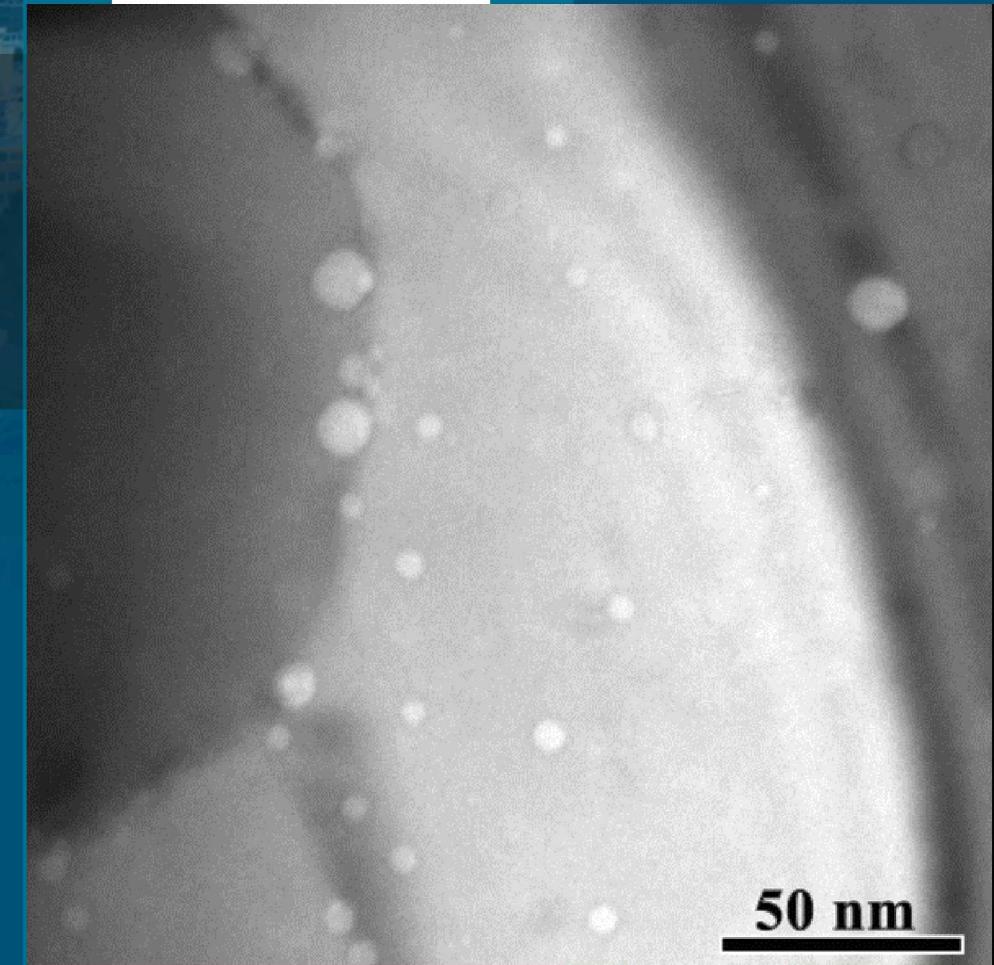
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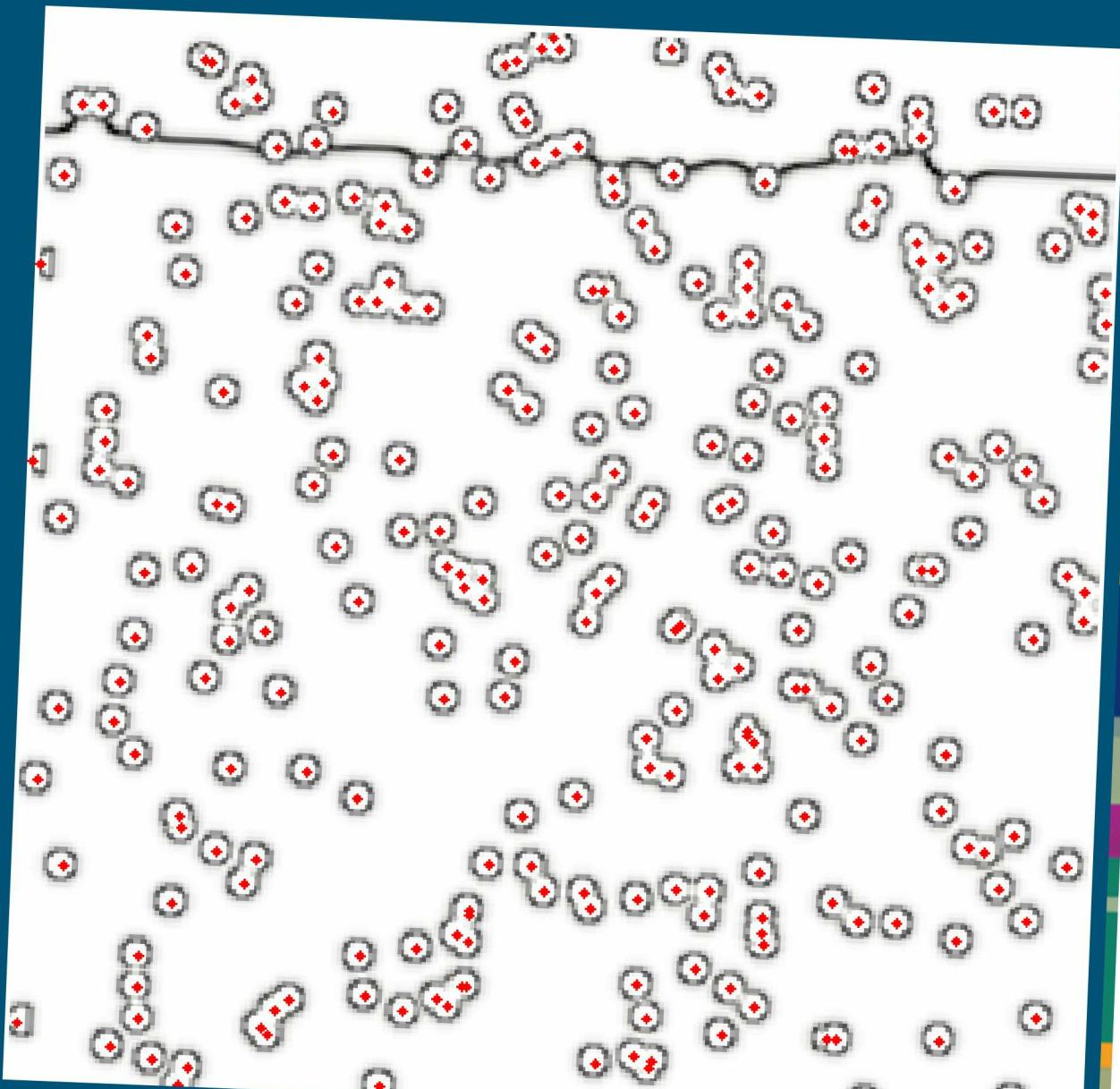


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Traditional grain boundary particle interaction

Zener pinning

Prevents motion of boundary through particles



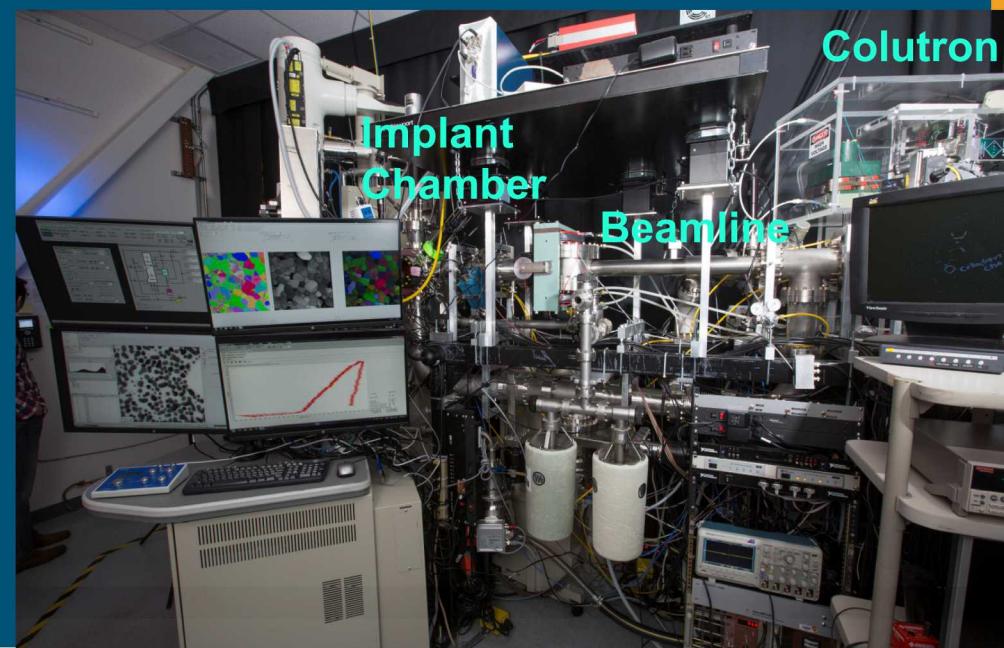


1. In-situ Helium Implantation

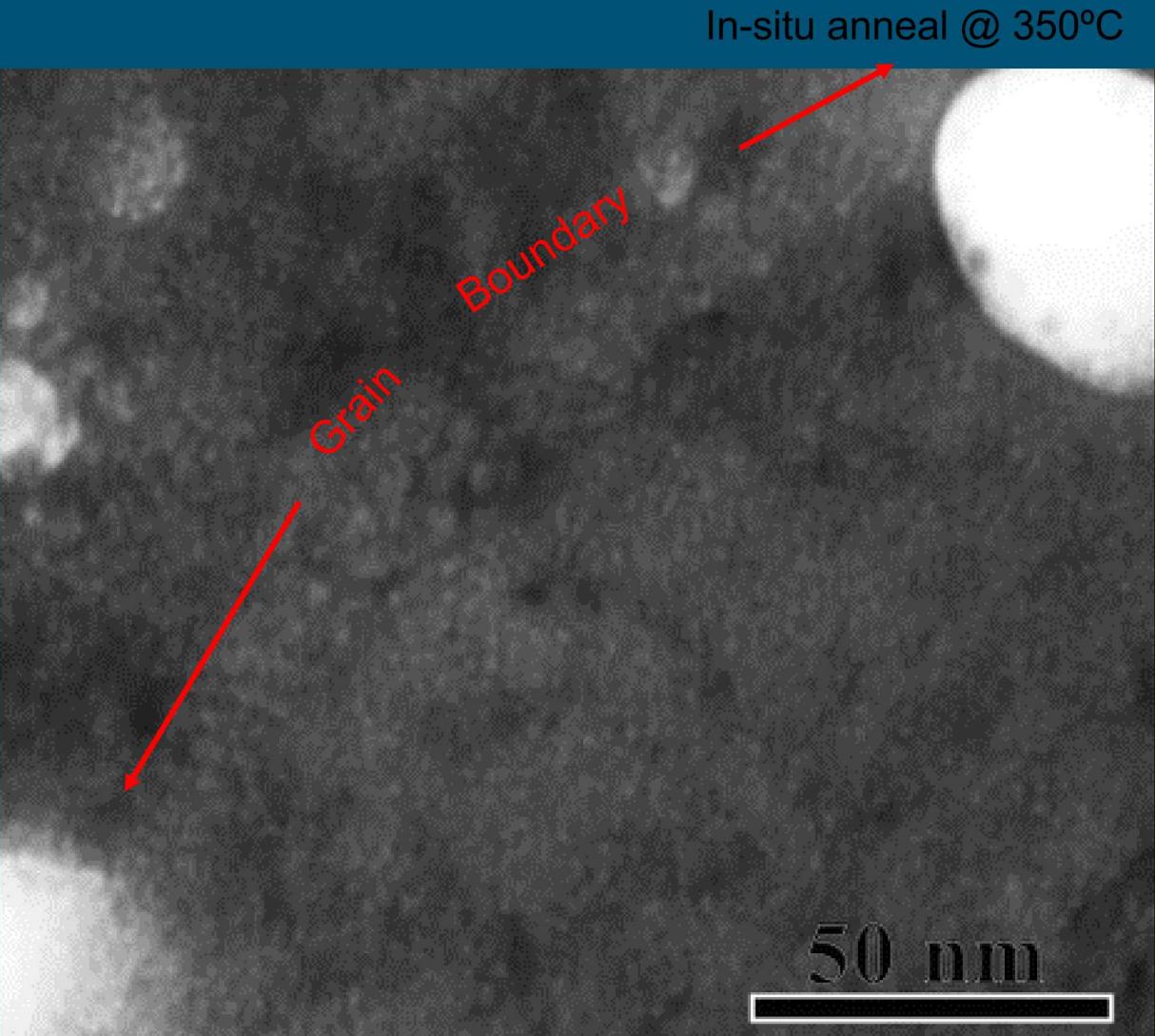
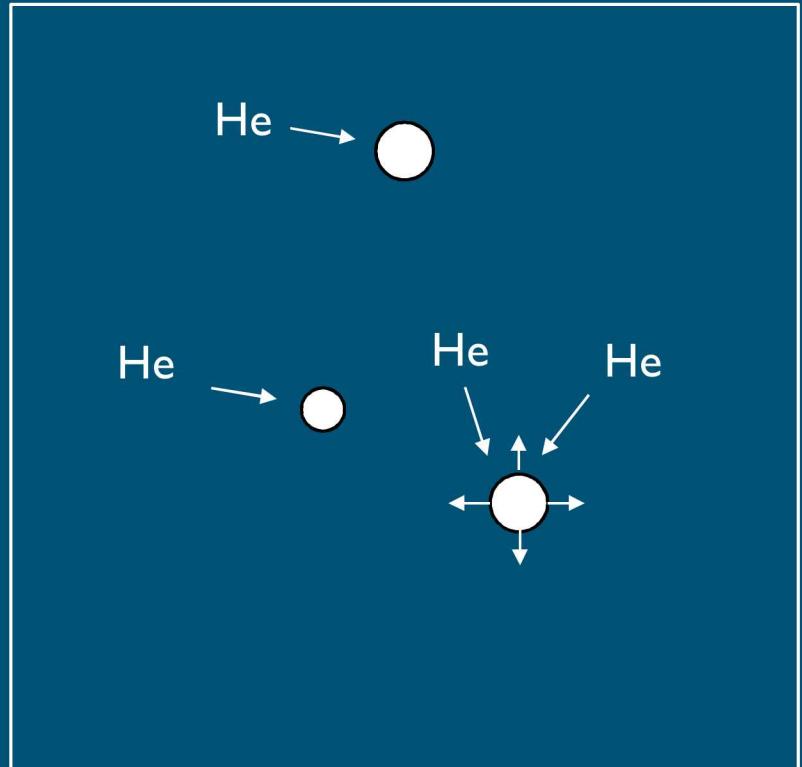
- Accelerated aging: reach high He concentration without making radioactive samples
- Bubble nucleation kinetics, nucleation sites, and growth
- How He behavior changes at room, elevated, and cryogenic temperatures

2. In-situ Annealing in Vacuum

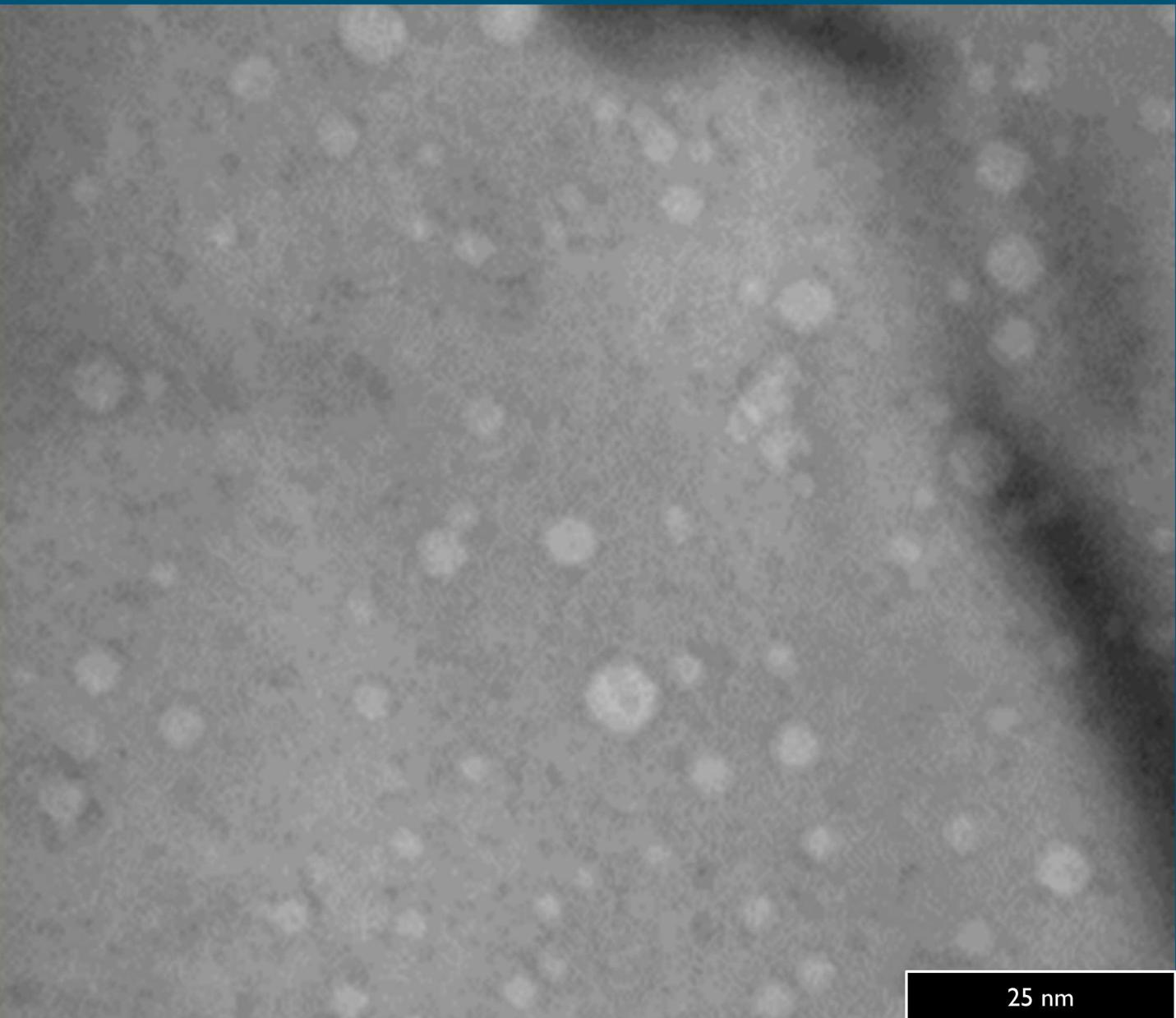
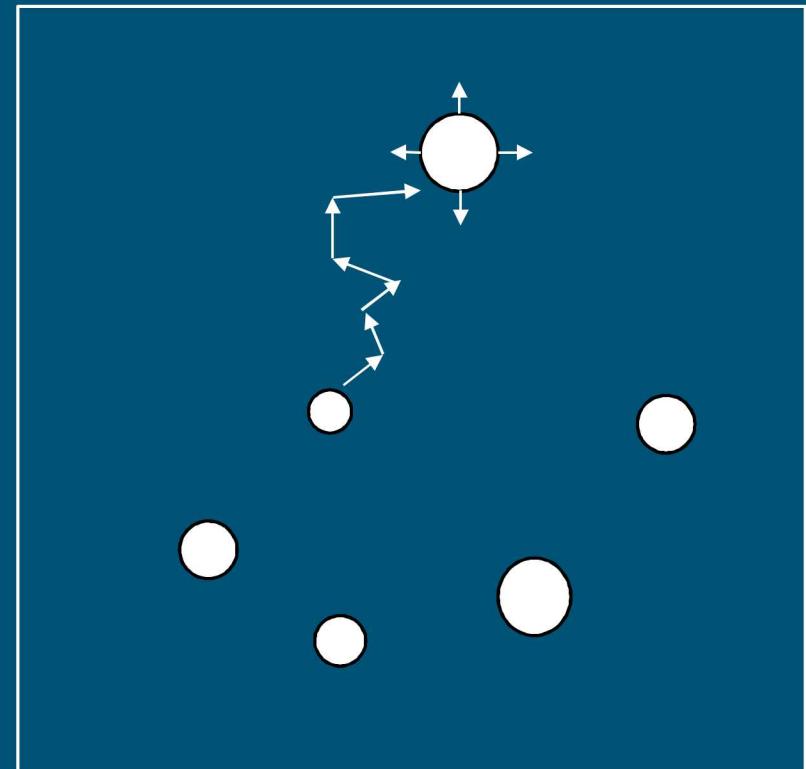
- How bubbles evolve under extreme temperatures
- Provides microstructural information important for interpreting thermal desorption data
- Accelerated aging method for understanding long-term bubble growth



Bubble growth

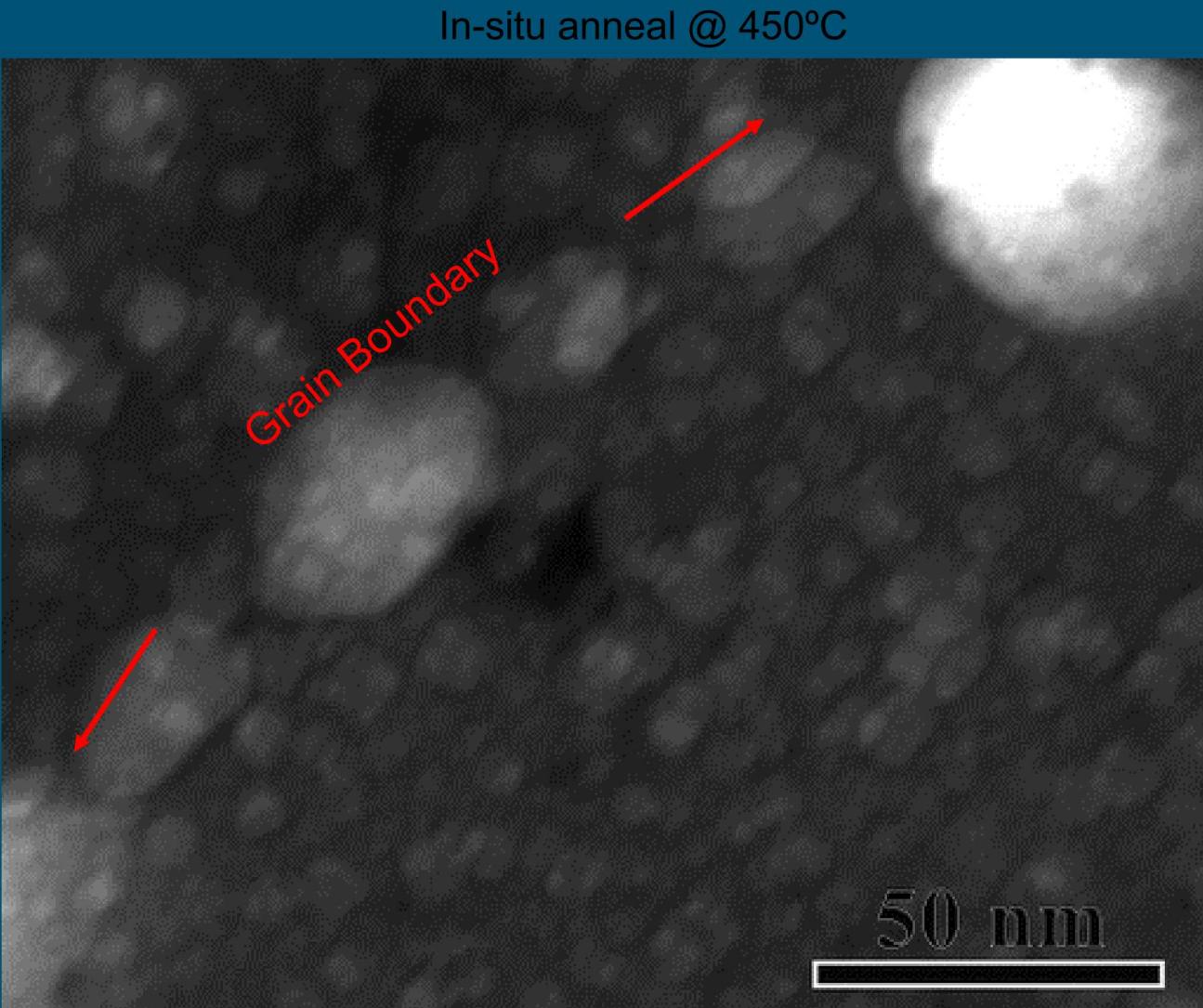
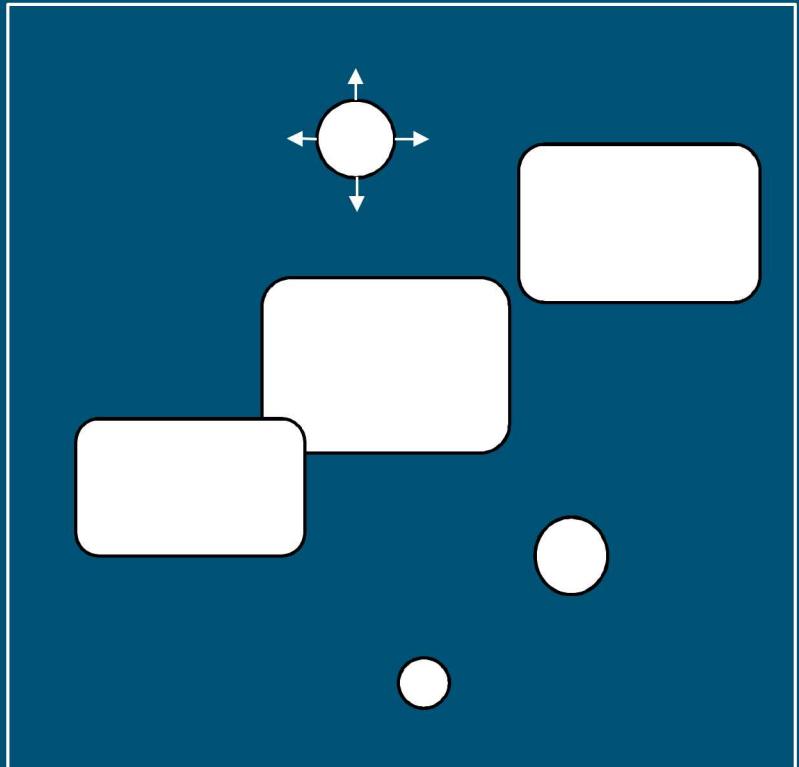


Bubble migration and coalescence

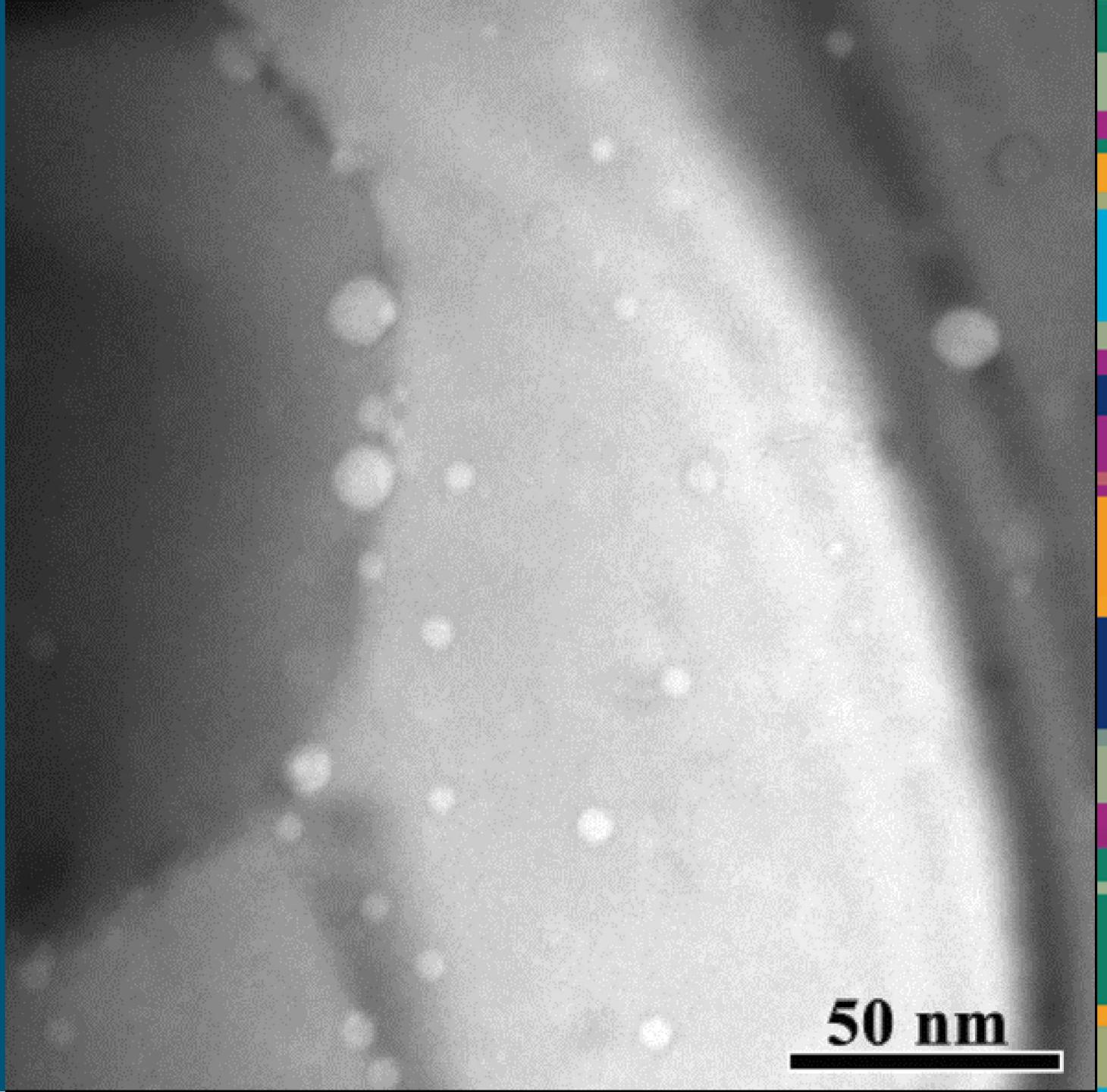


25 nm

Rupture

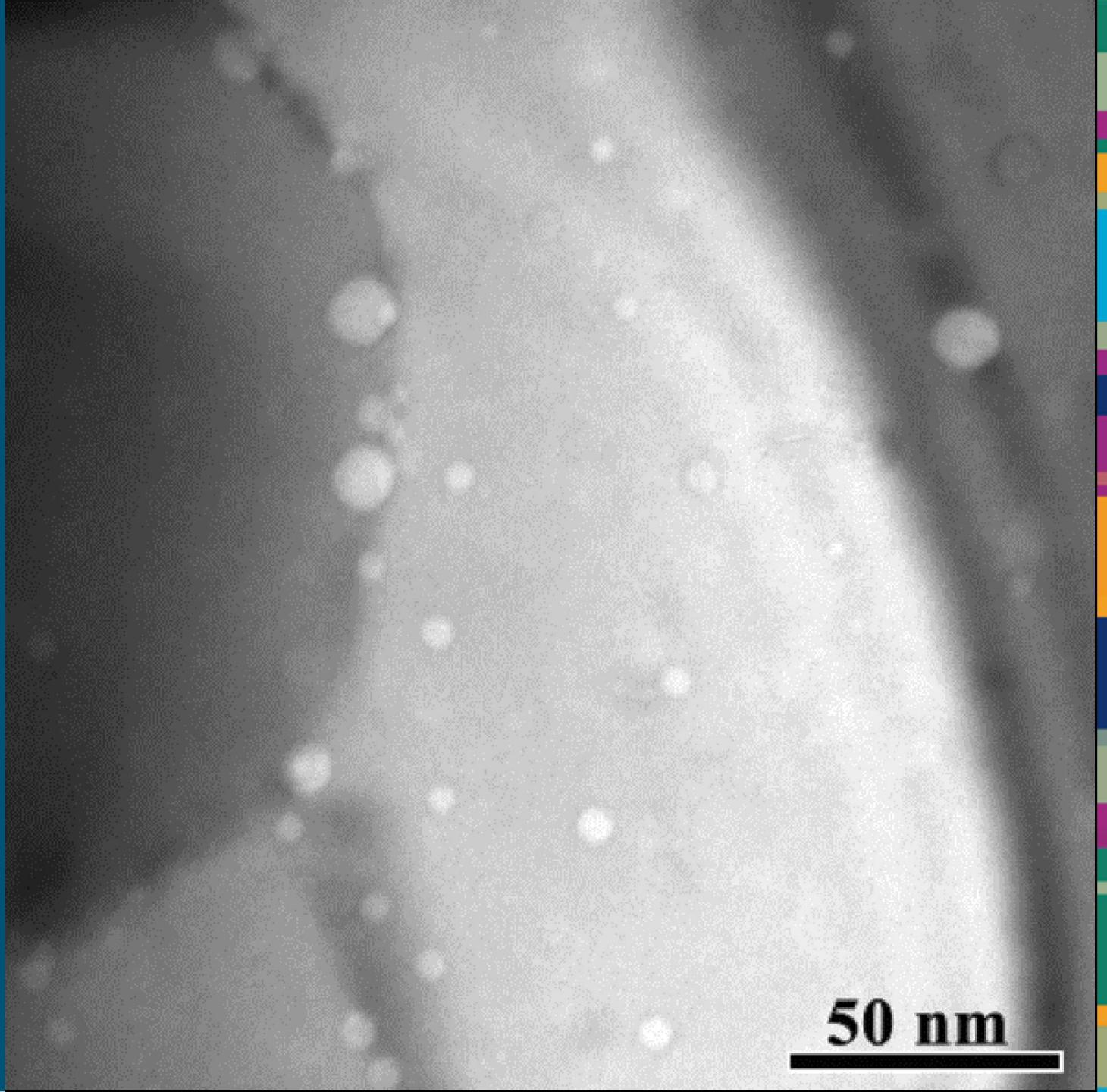
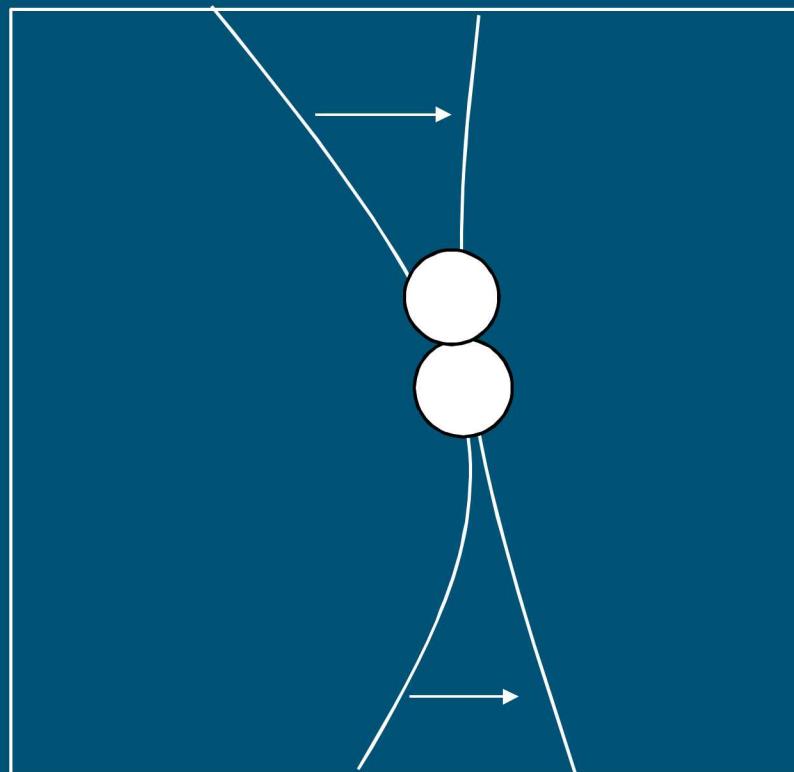


7 | Complex interactions

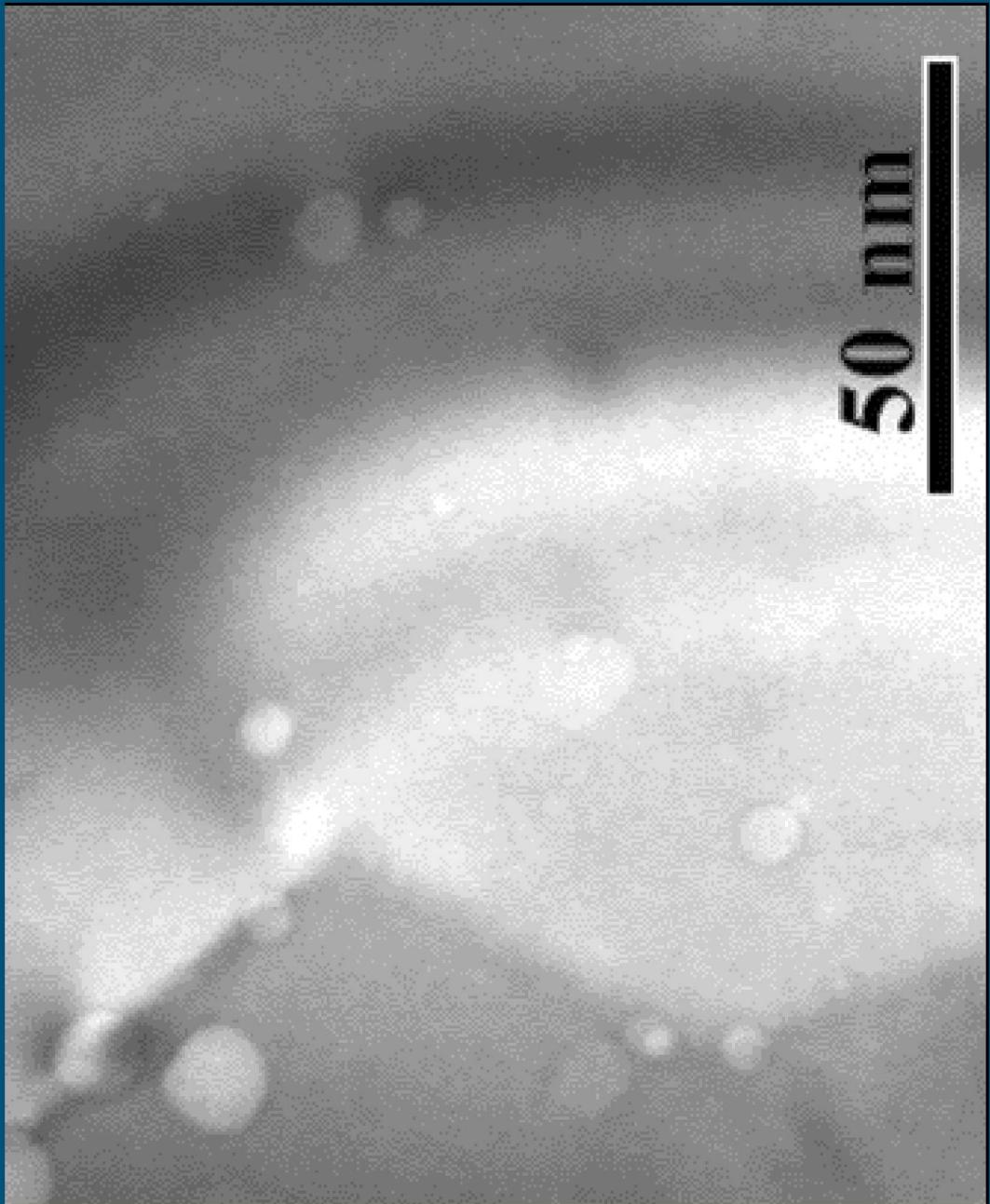


50 nm

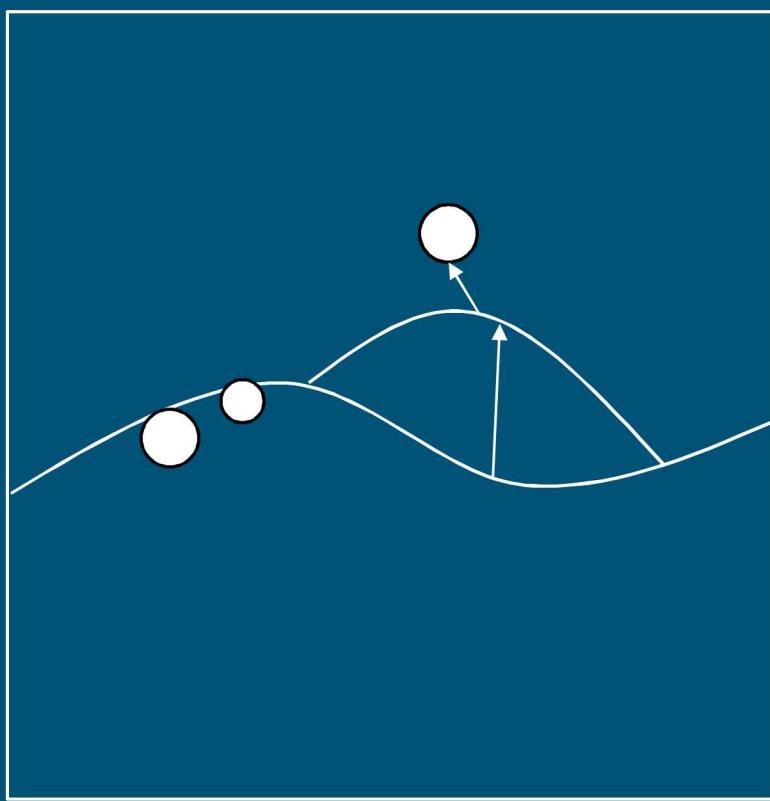
GB pinning



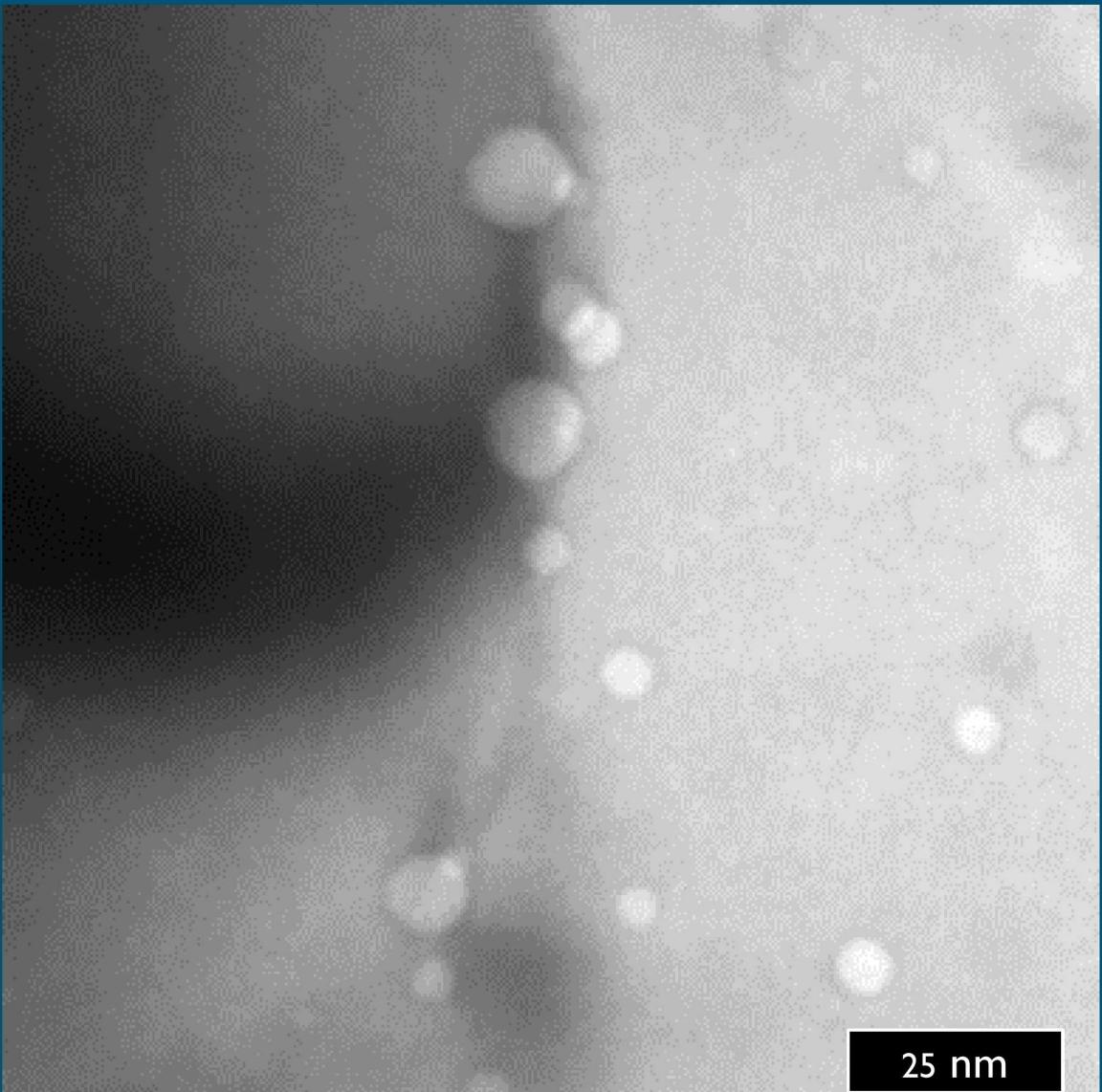
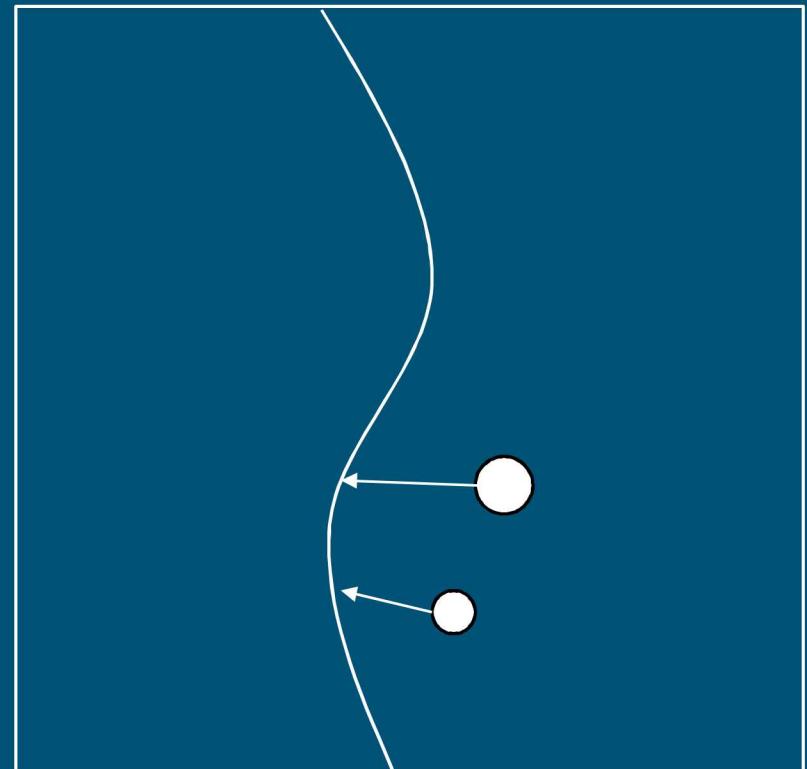
50 nm



GB bulging

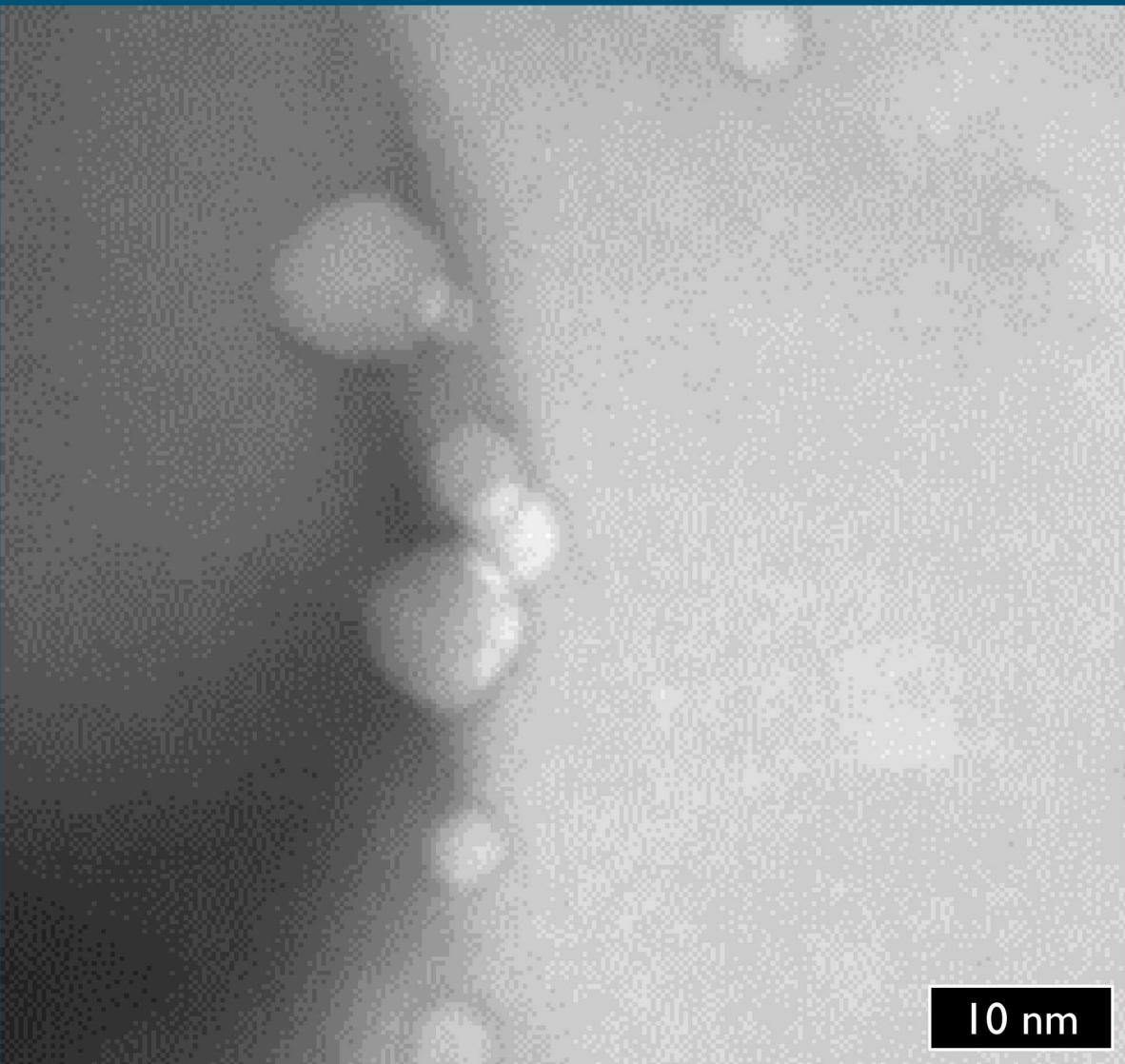
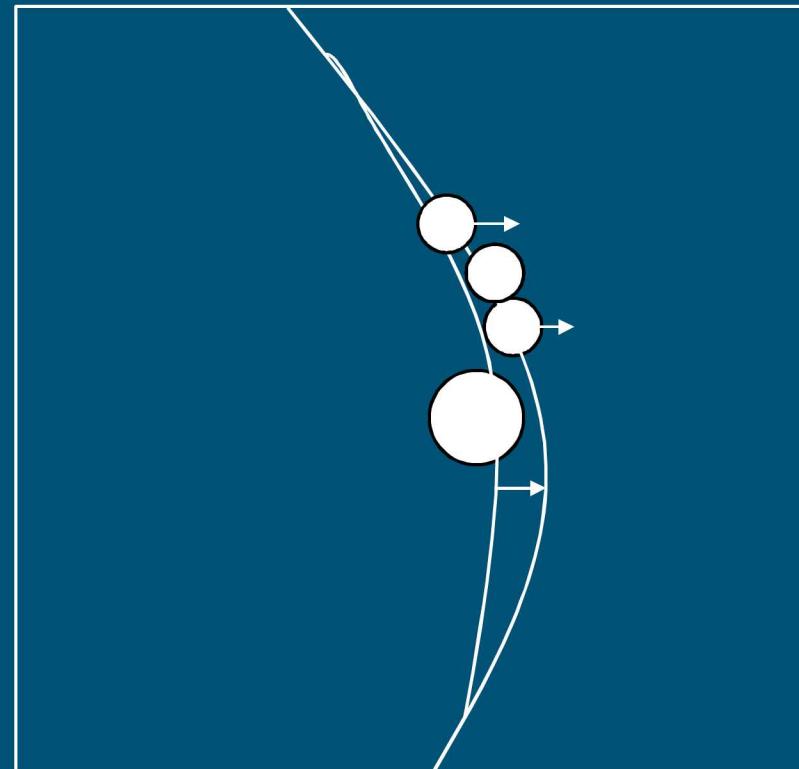


GB trapping of bubbles



25 nm

Escape from GB

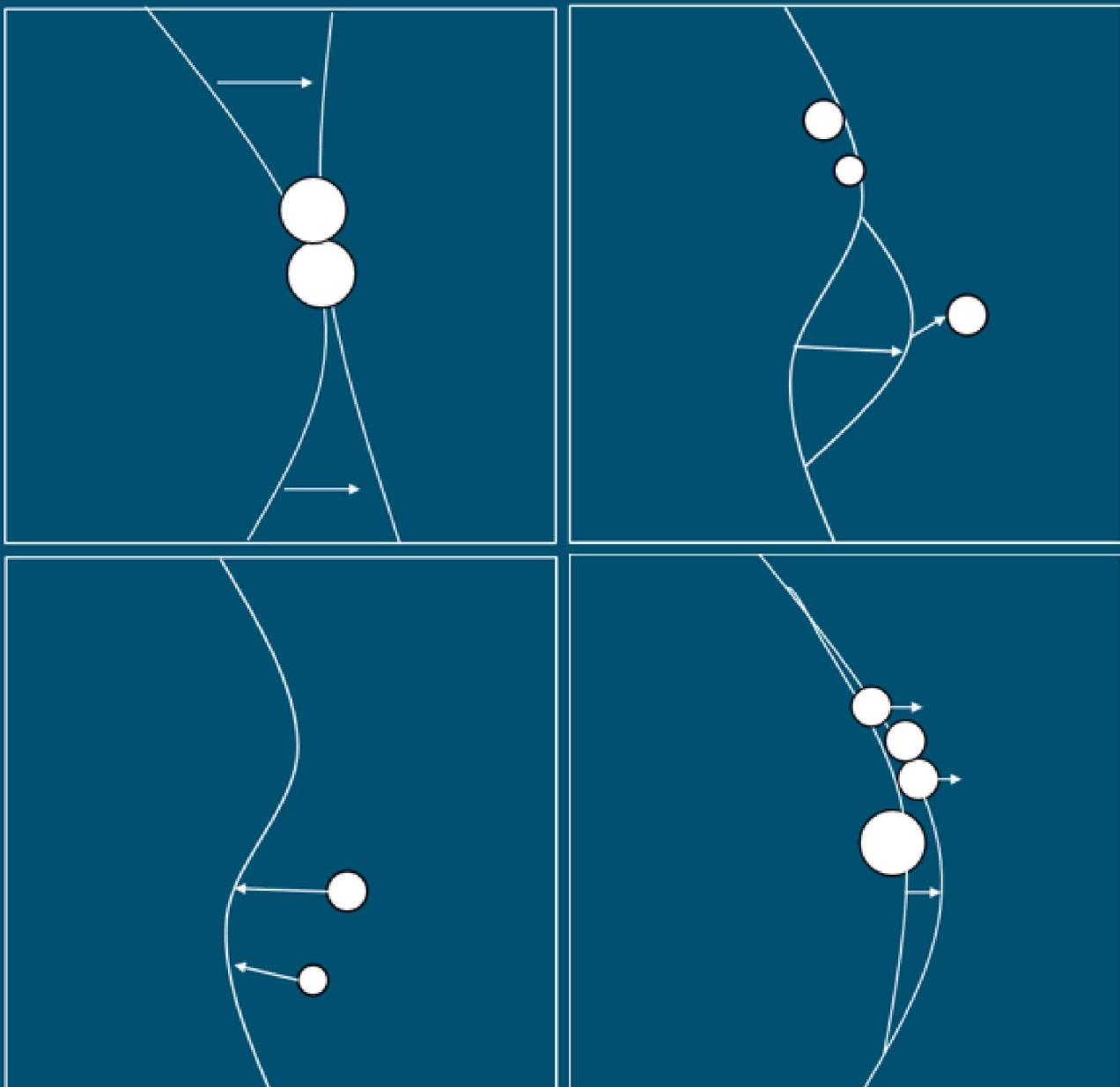


10 nm

Summary

- Complex bubble – boundary interaction
- GB pinning
- GB bulging
- Dragging in GB
- Trapping in GB
- Escape from GB

Not purely one mechanism



Future work

In situ SEM

Surface morphology

Low energy ion gun

Laser port
Tandem line

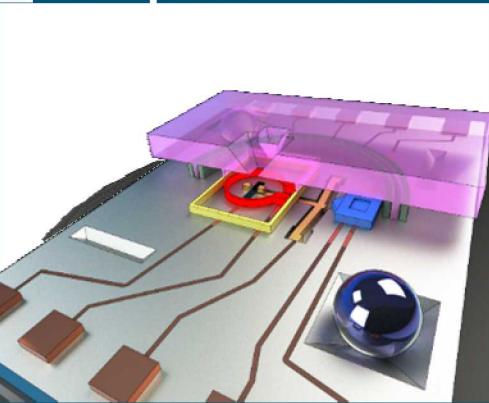


Related Sandia's USER Capabilities



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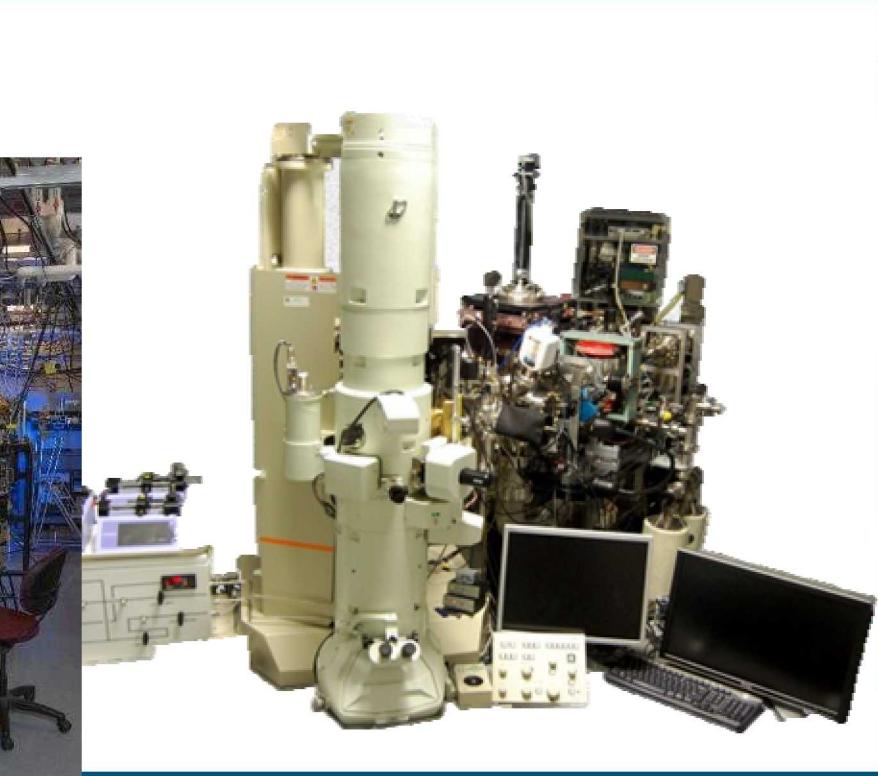
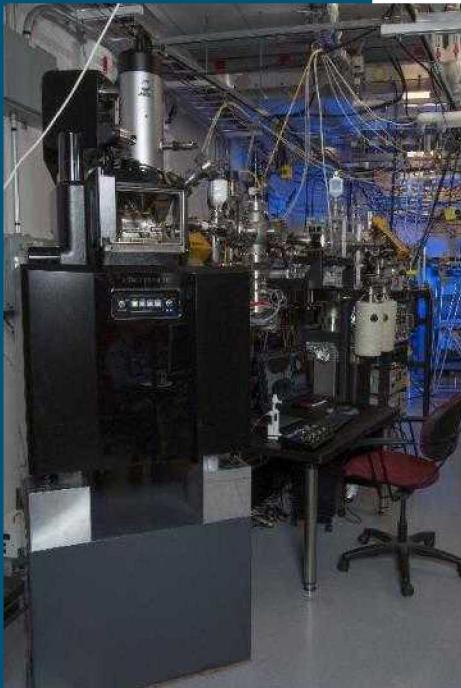
- Spring and Fall proposals for 18 months
- Rapid Access proposal anytime for 3 months



Core Facility - SNL



Gateway Facility - LANL



www.nsuf.inl.gov

- Three proposal a year for 9 months



Acknowledgements

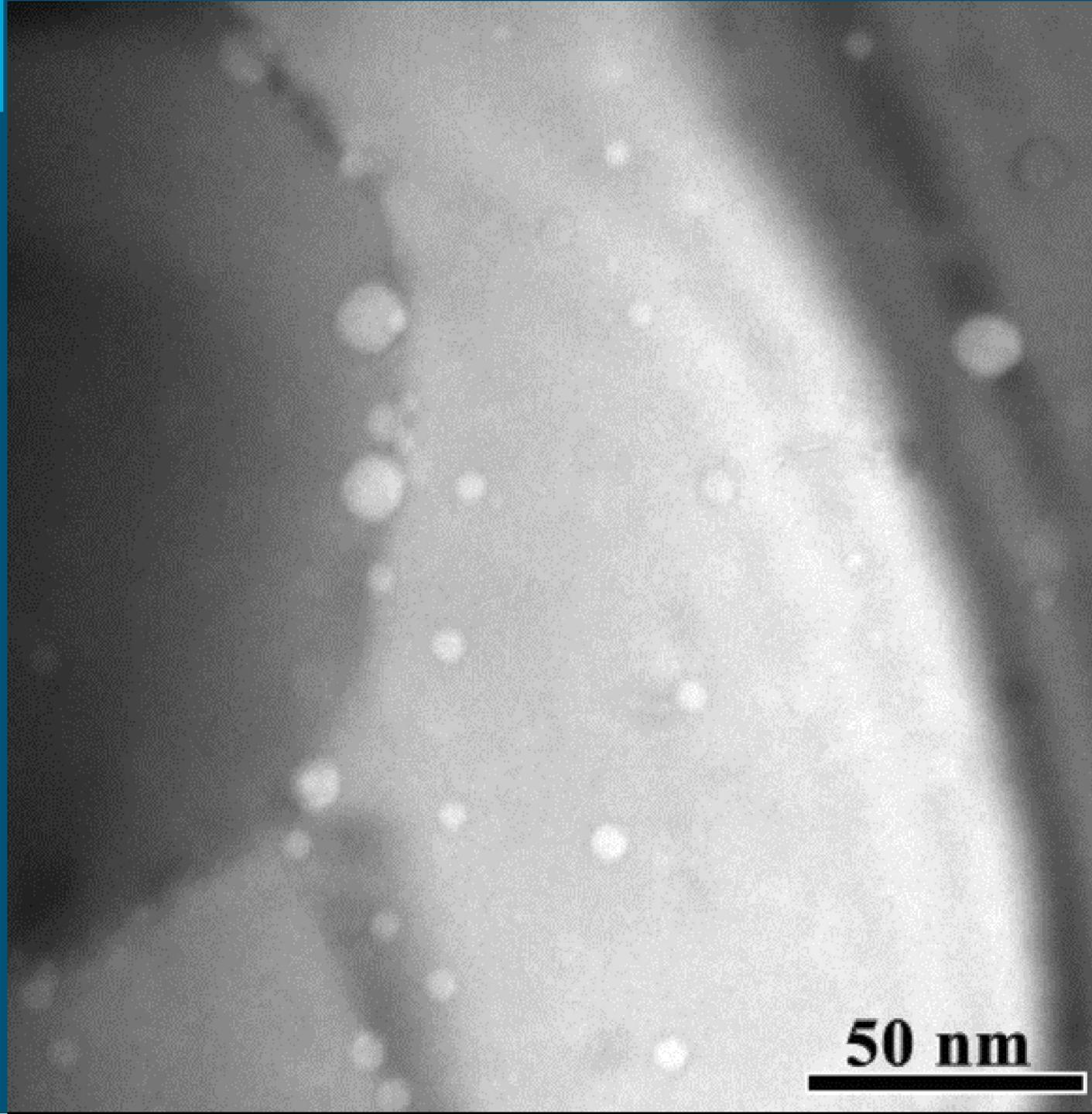


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Questions