

Surface Phonon Polaritons and Engineered Reststrahlen Bands

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Tischler Group

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Light-Matter Interaction **LAB**



Why are we interested?



Sensing

Microchip
thermal
management

Nanoscale
Imaging

Communication

My Research Questions: Was the CINT sample etched well? Can we accurately make taller gratings?



Surface Phonon Polaritons



- Phonon
 - Quasiparticle
 - Collective excitation of particles
- Phonon Polaritons
 - Light couples with lattice vibrations

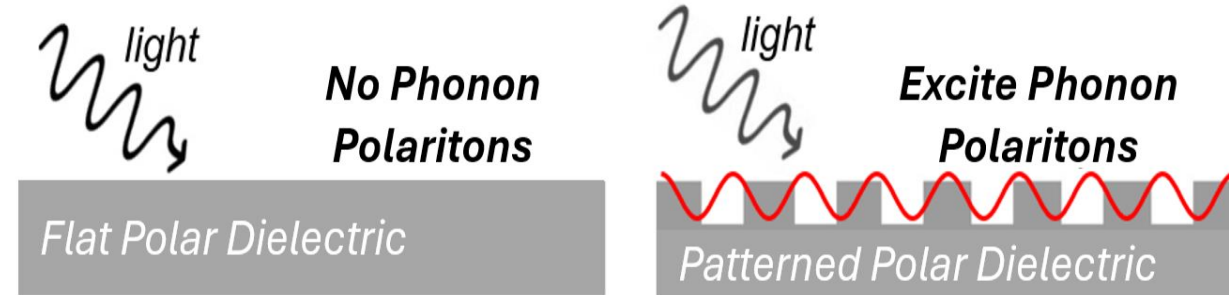


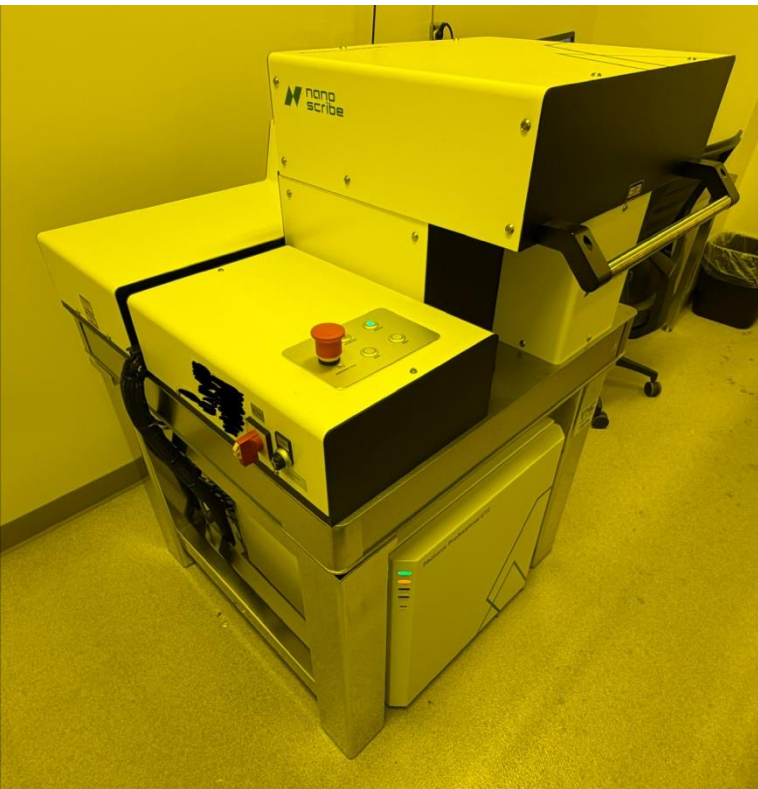
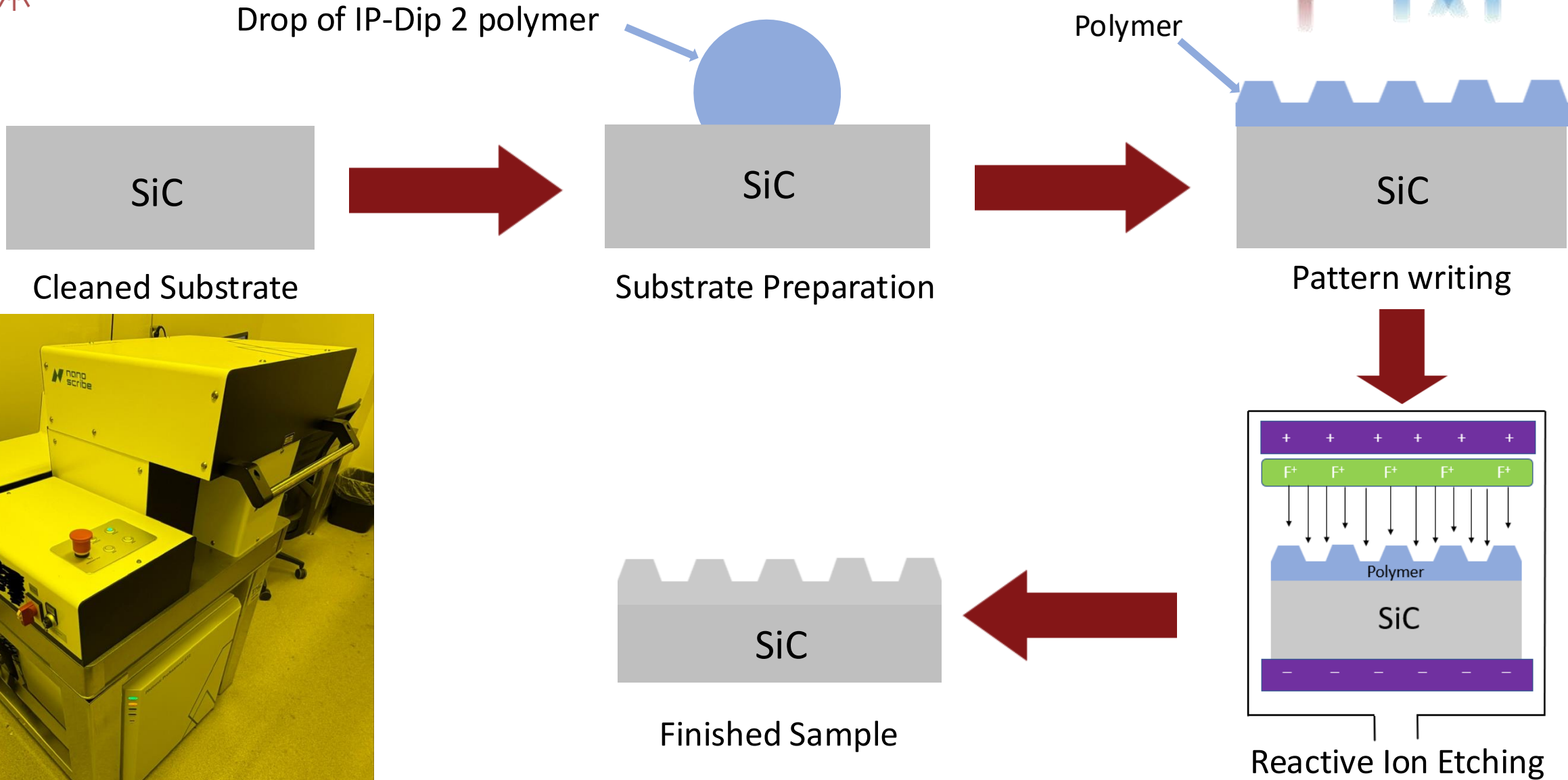
Diagram from Dewa Ade-Onojobi

https://en.wikipedia.org/wiki/Phonon_polariton#Surface_phonon_polariton

<https://en.wikipedia.org/wiki/Phonon>

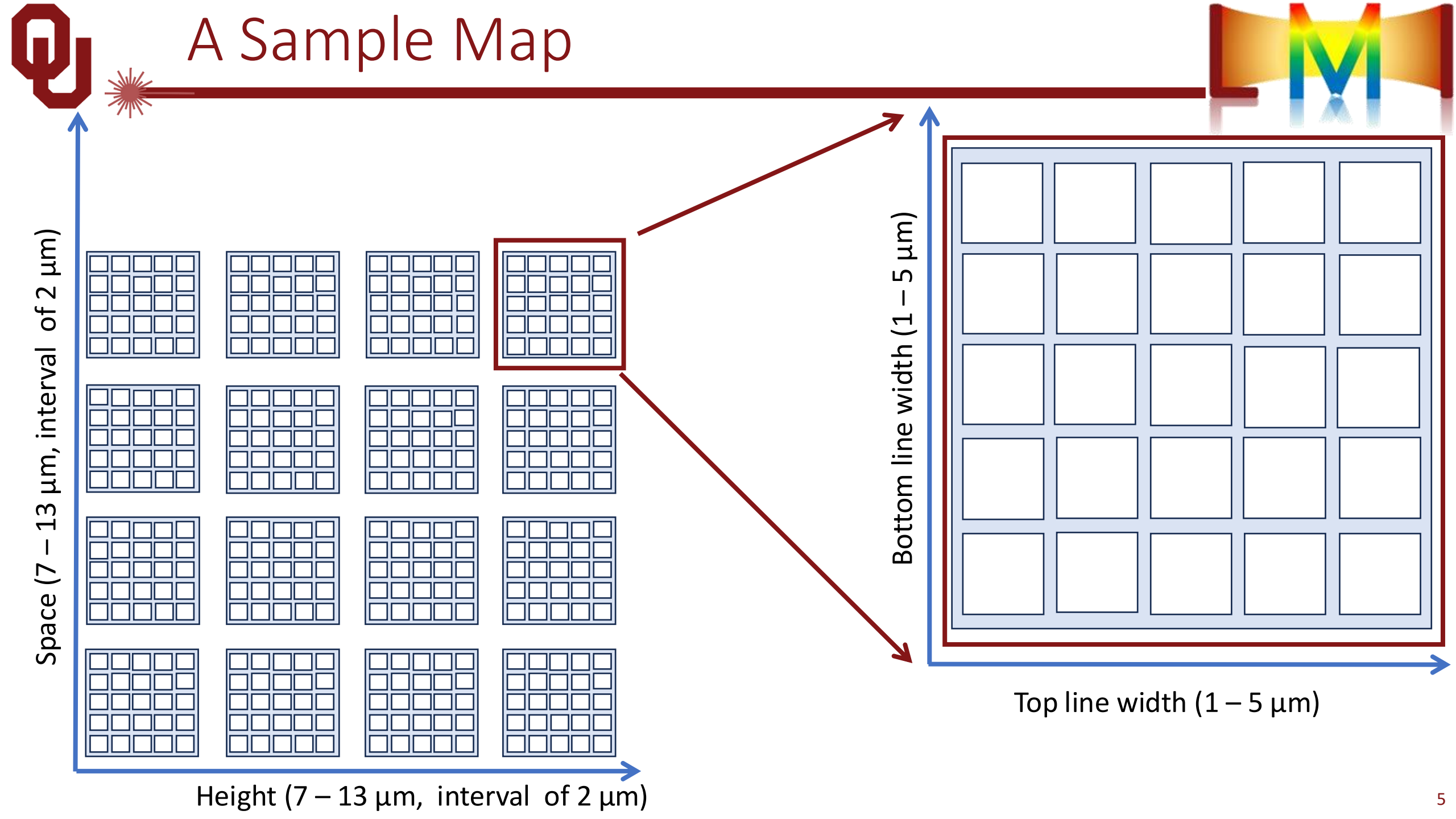


Grating Fabrication



Nanoscribe
PPGT2

Diagram from Dewa Ade-Onojobi





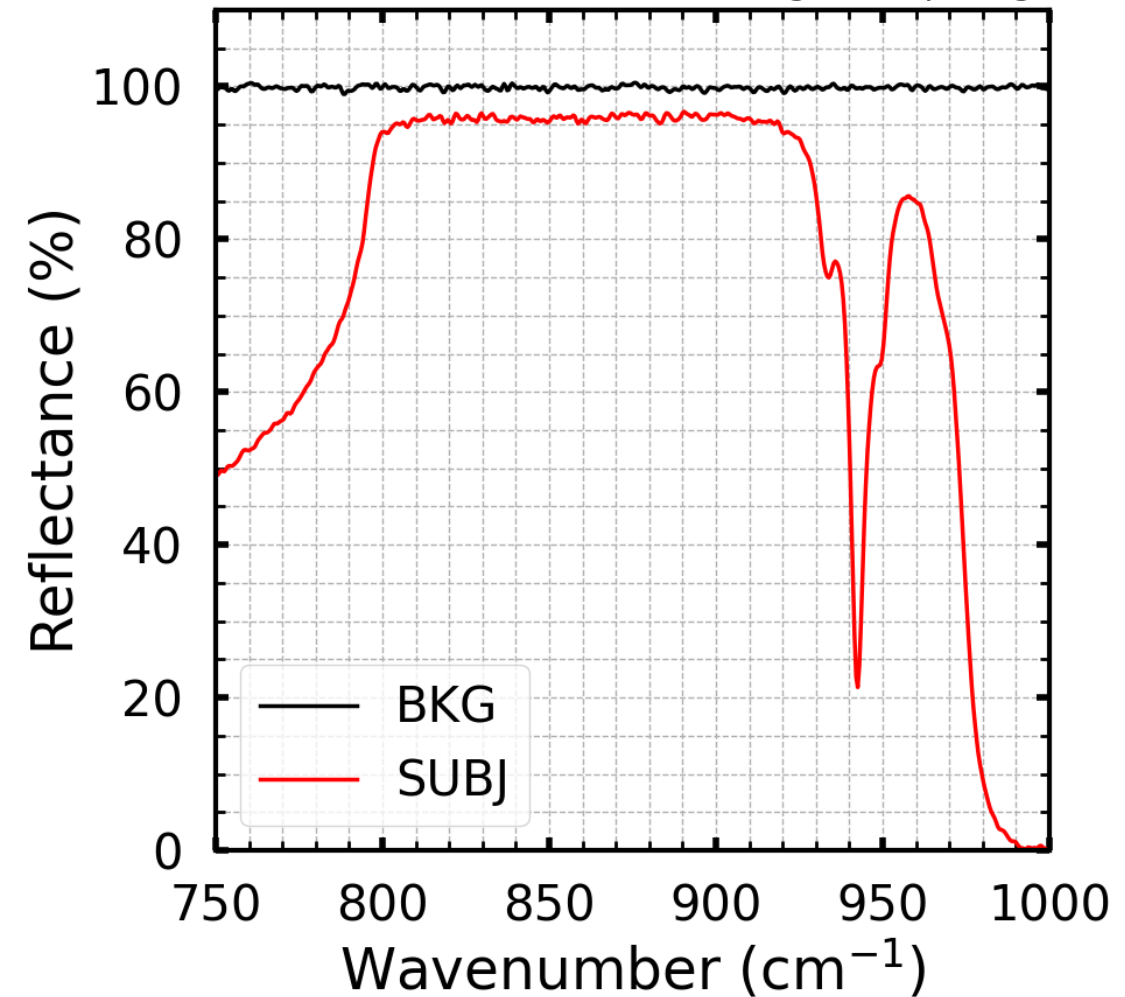
Reststrahlen Bands



- A range of frequencies that are unable to propagate within a substrate
- Results in very strong reflection
- Engineering surface allows surface phonon polaritons to form at specific Wavenumbers

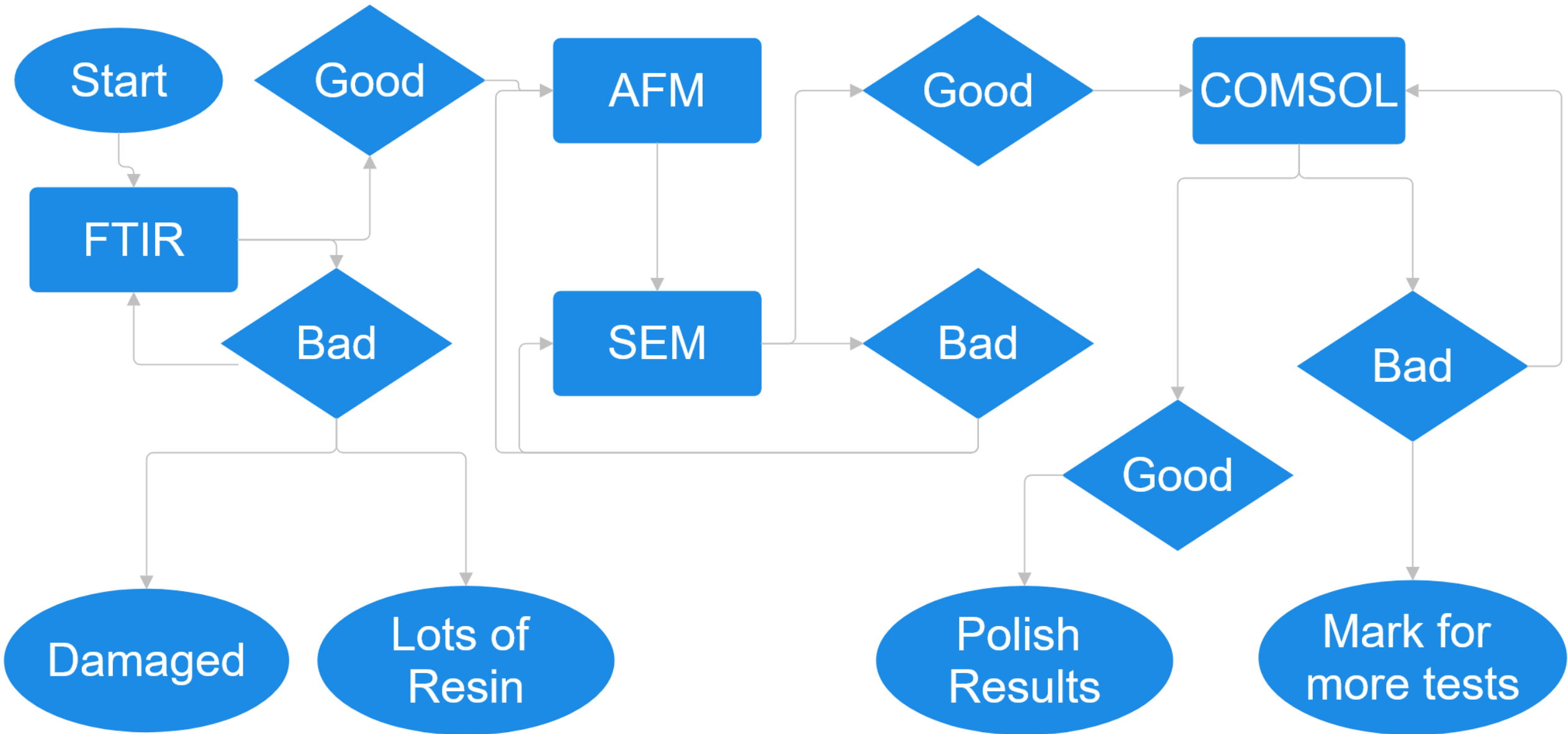
DOA10212024

Date: 2026-06-08 TLW: 1 BLW: 5 Height: 3 Spacing: 1





My Workflow



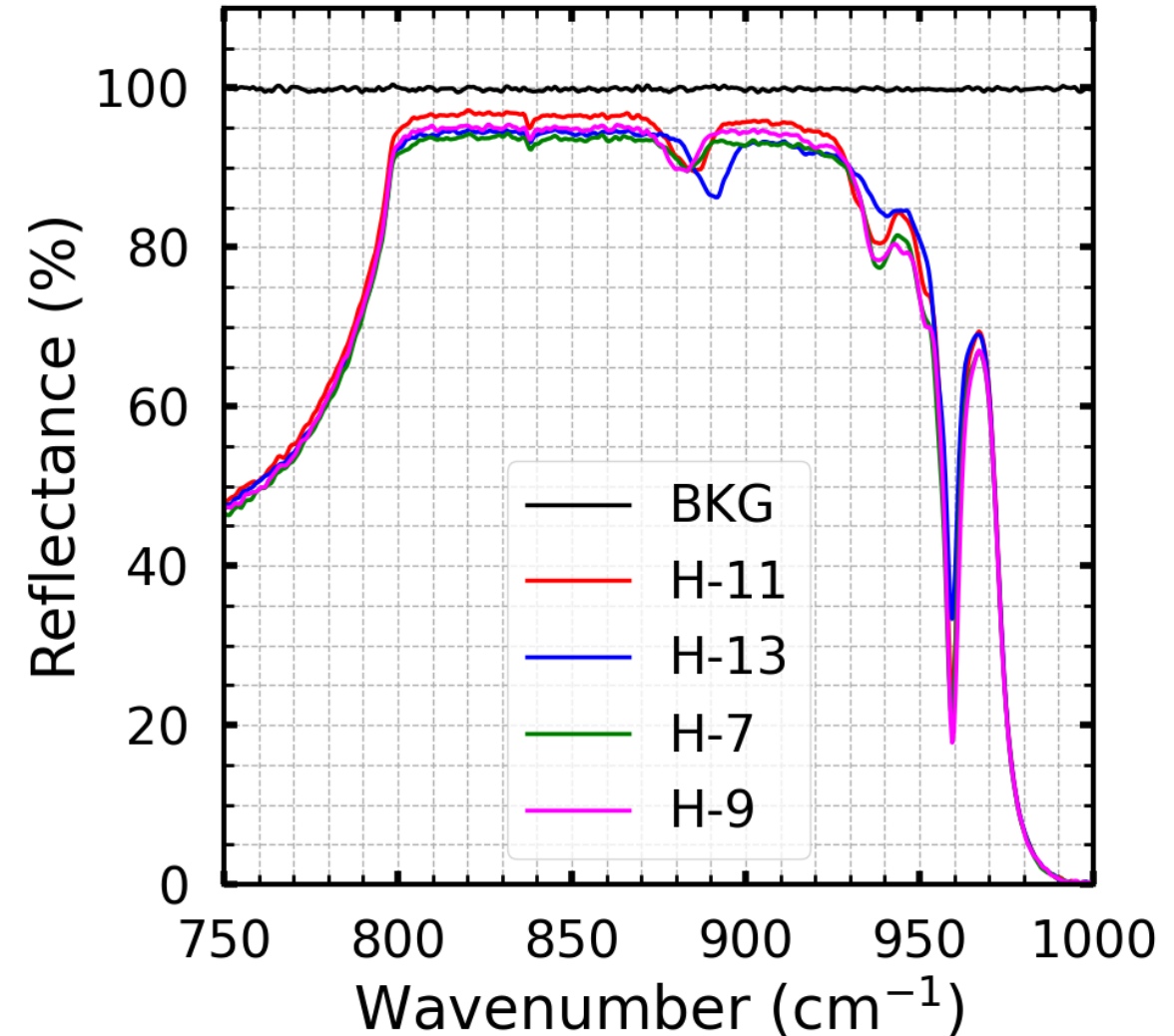


Fourier Transform Infrared Spectroscopy



DOA06022025

Date: 2026-06-22 TLW: 2 BLW: 2 Spacing: 7

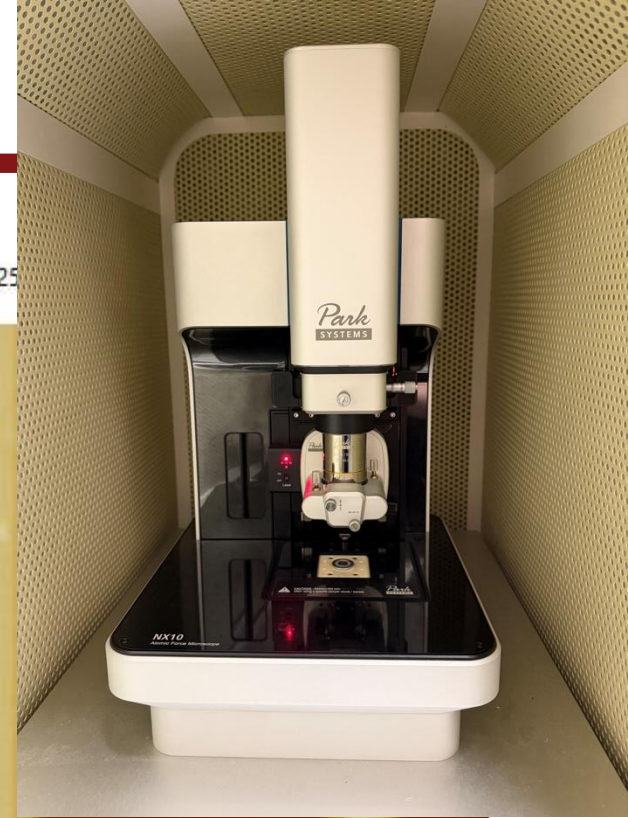
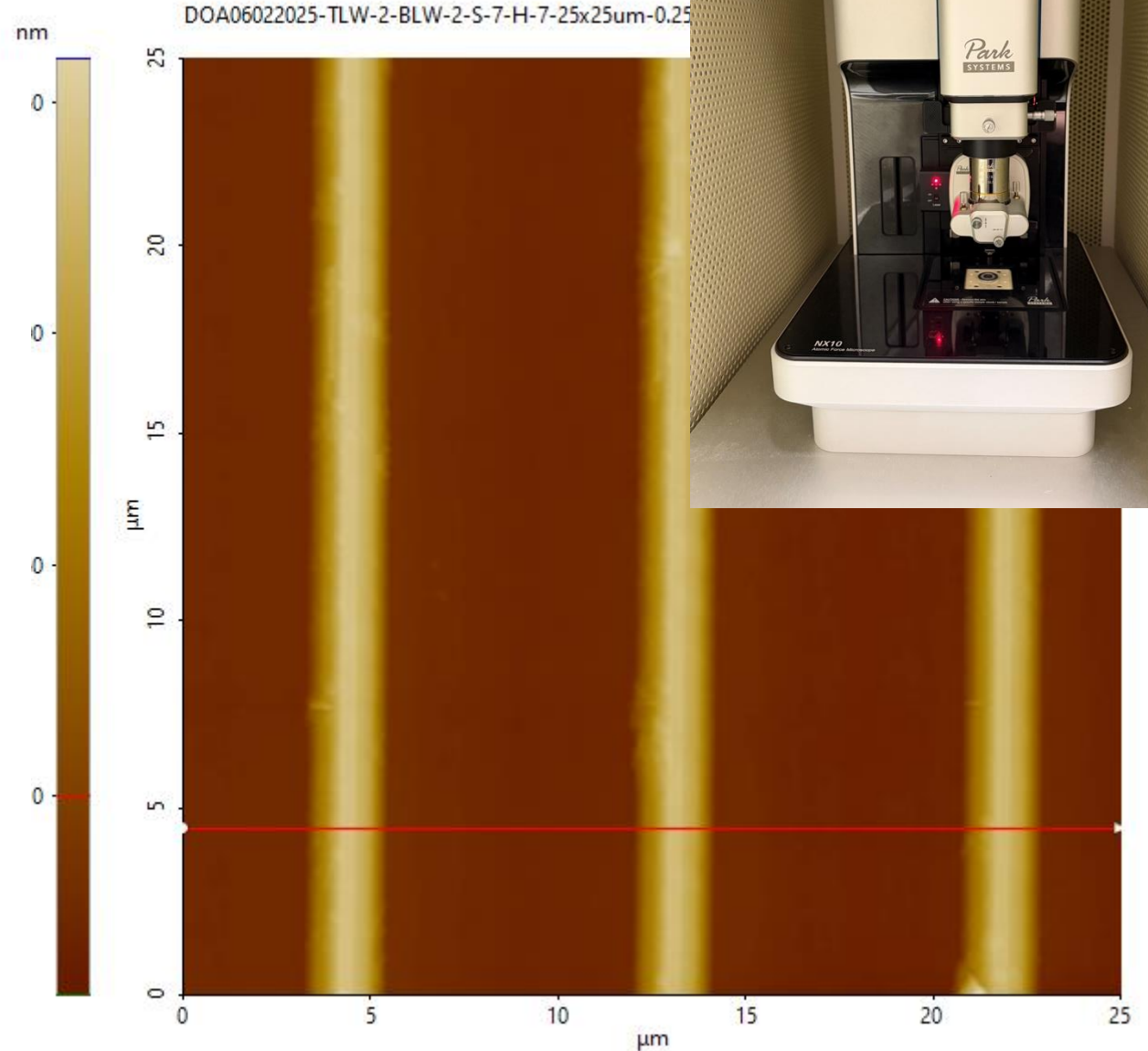
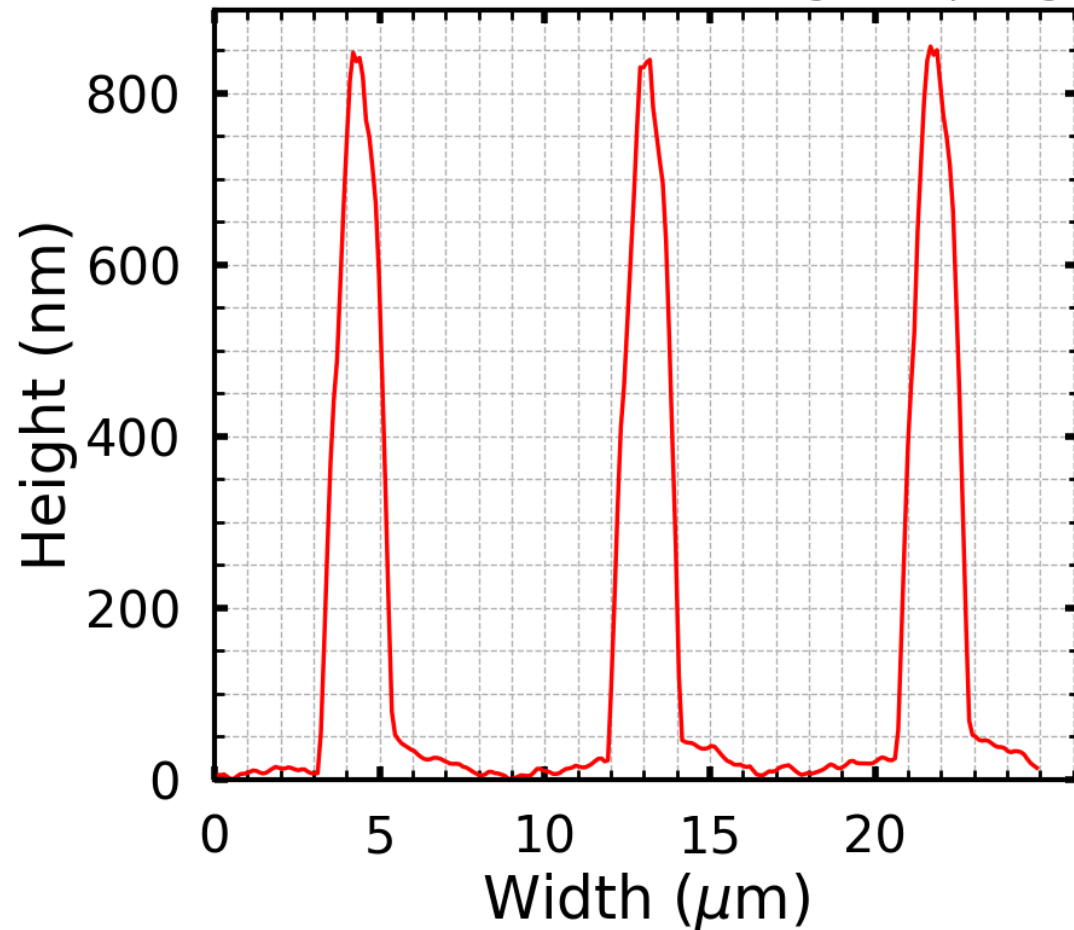




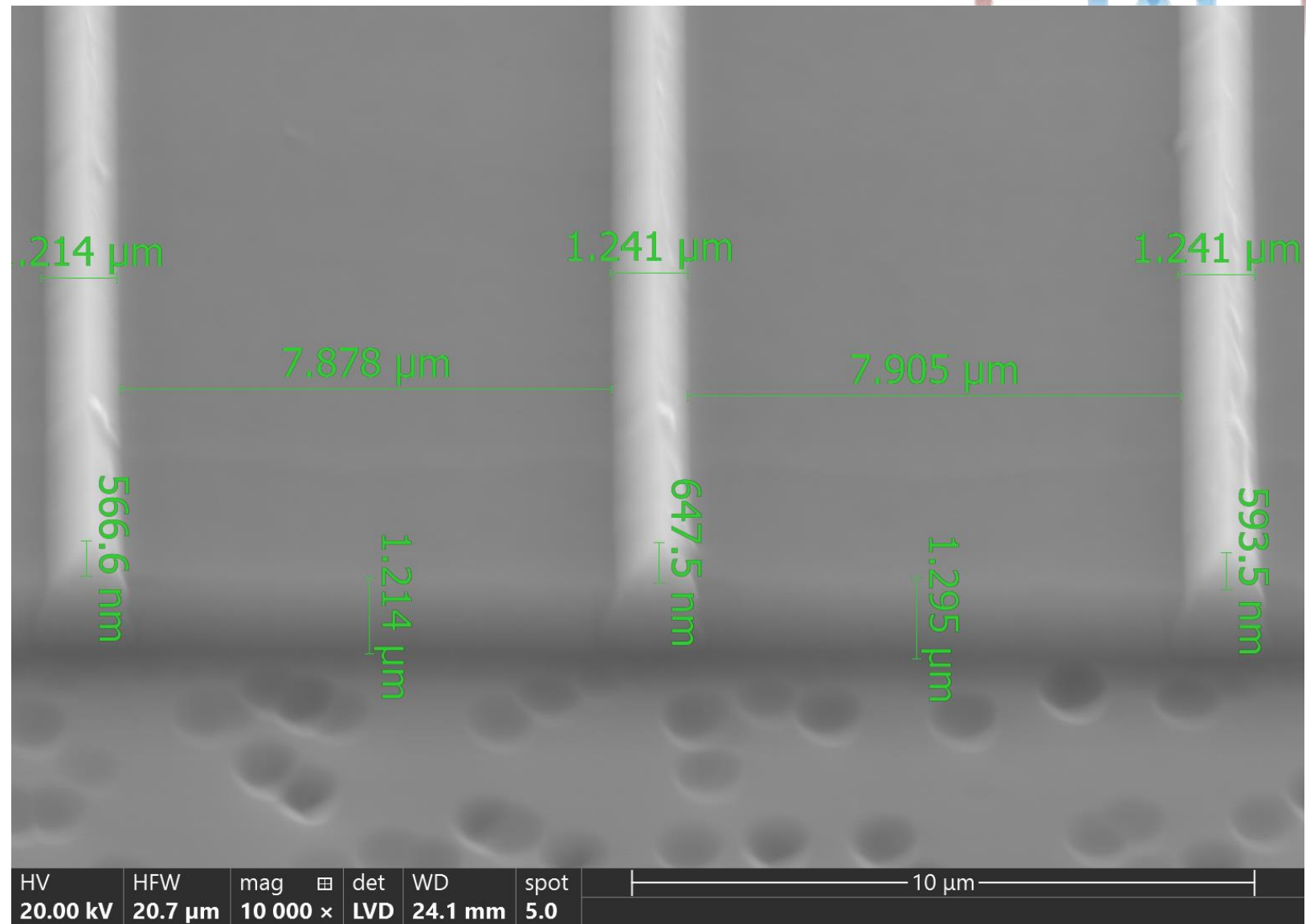
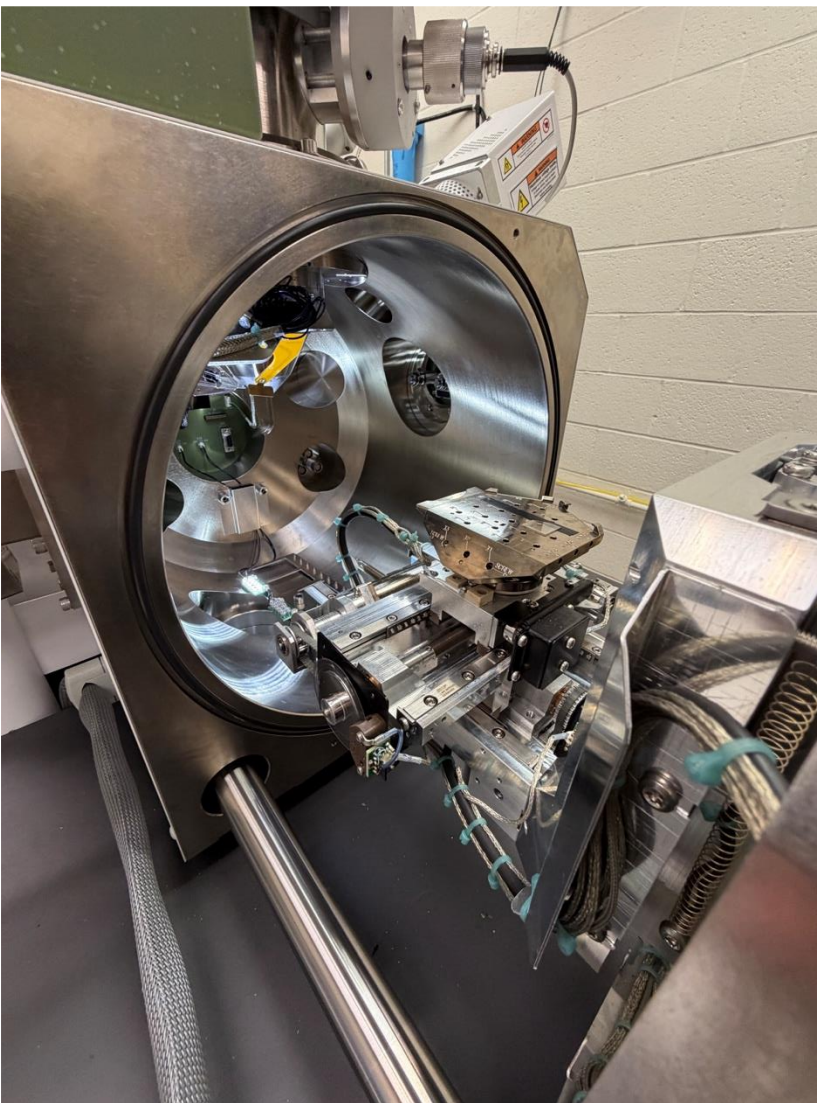
Atomic Force Microscope

DOA06022025

Date: 2026-07-01 TLW: 2 BLW: 2 Height: 7 Spacing: 7



Scanning Electron Microscope



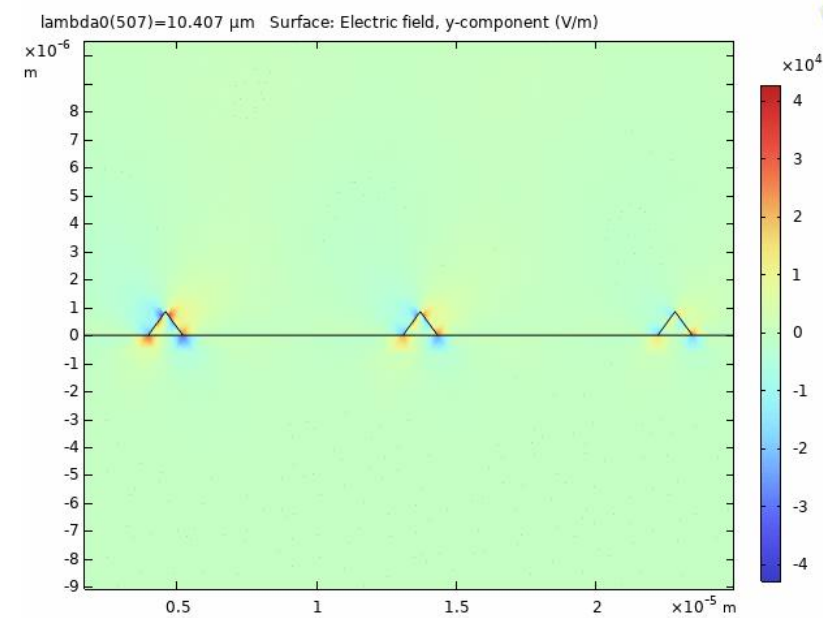
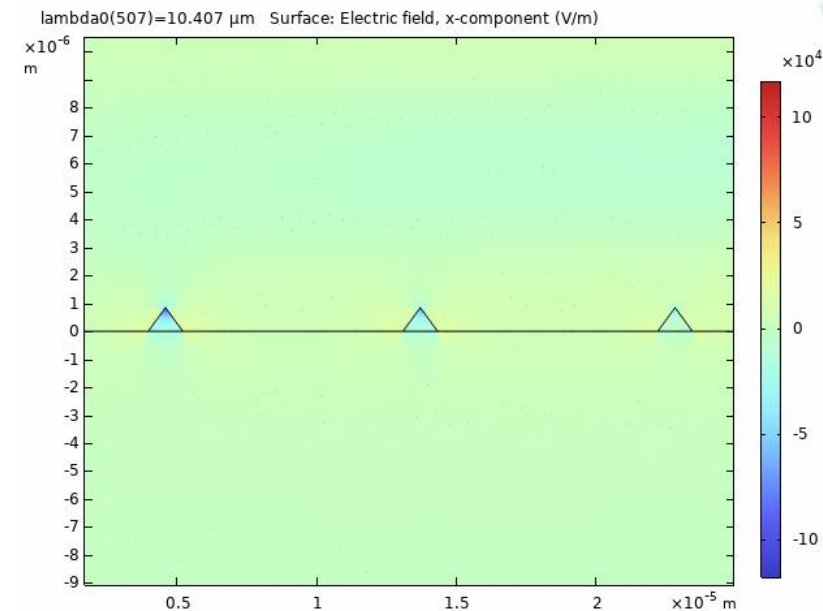
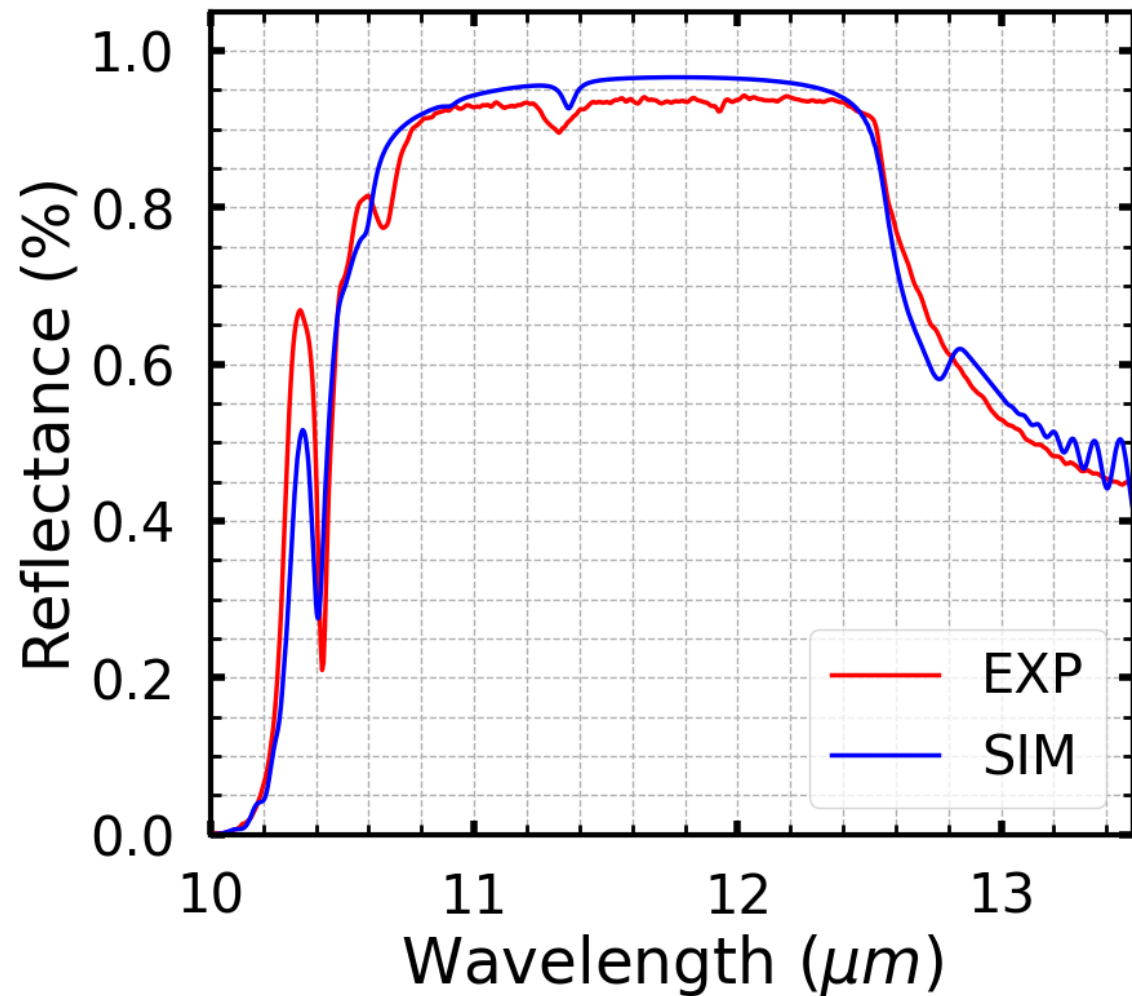


COMSOL (simulations)



DOA06022025

Date: 2026-07-17 TLW: 2 BLW: 2 Height: 7 Spacing: 7 Incidence: 3.5





My Research Questions: Was the CINT sample etched well? Can we accurately make taller gratings?

1. Not fully etched
2. We can make tall triangles



Questions?