LAr R&D Progress Updates

Yichen

8/18/25

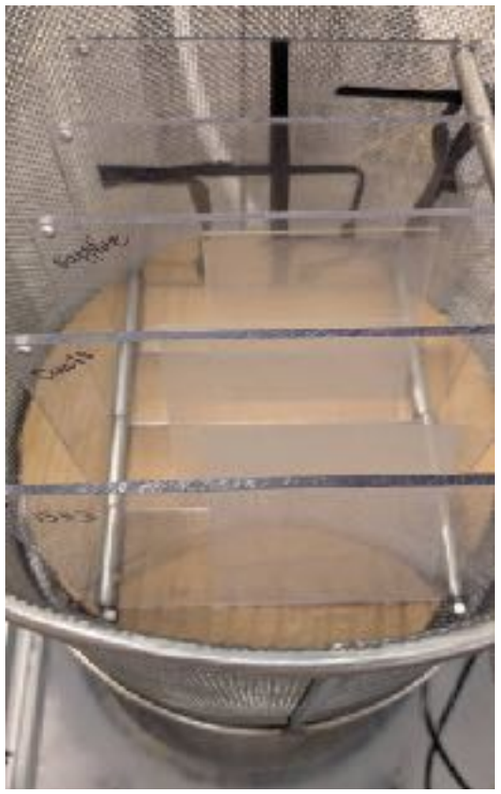
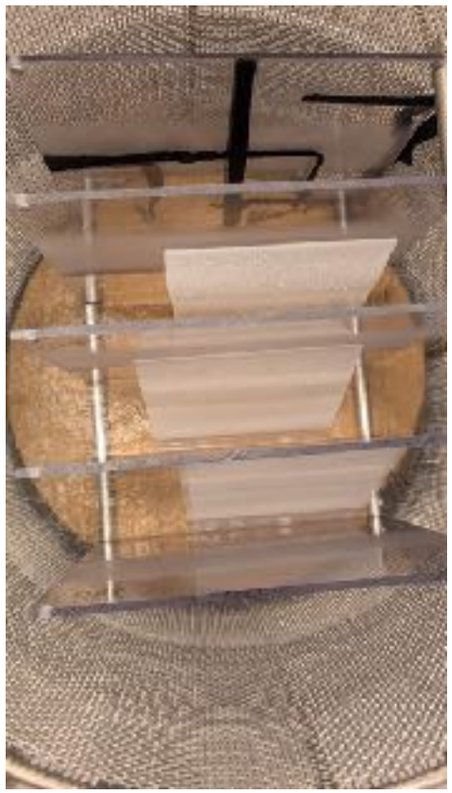
Lab Safety and Space Management

- **Planned power outage 8/22-9/14**
  - Complete power outage for a day or two
  - 4x outages in Bldg 510 on every weekends between Friday 6pm to Sunday 3pm, starting from this weekend on 8/22
  - I've briefed the group about the outage
    - Reminders of turned off all electrical devices before leaving home on Friday
  - Developing a checklist to go over with all ECPs and system owners
    - LAr lab-Yichen
    - CE lab-Lingyun, Shanshan
    - Robotic testing station-Shanshan
    - 2nd storage labs, Guang

Thermal stress test on pTP filter

- **Vertical dipping test**
  - Simulation of the vertical mount PD module immersion process
  - Using the CE test open mouth LN2 dewar and a shelf to maintain the position in the basket
  - Steps:
    - Cleanup the dewar, top off with LN2
    - Drop the basket on top of the LN2 to ensure the gradual cooling process
    - Leave the samples on top of the LN2 surface for ~30 mins
    - Slowing dropping the basket into the LN2, takes about 10 mins
    - Leaving the samples in LN2 for about 18 hrs
    - Pulling the basket out of LN2, leaving the basket on top of LN2 for 30 mins
    - Pulling the basket up, halfway between the liquid and dewar top for 30 mins
    - Pulling the basket off the dewar, waiting for 30 mins until the surface temperature measured above 0 C
    - Applying fans to accelerate the drying for 1.5 hrs
    - Pull the samples into the dryer with ~30C drying temperature for 1 hr

Thermal stress test (Vertical)

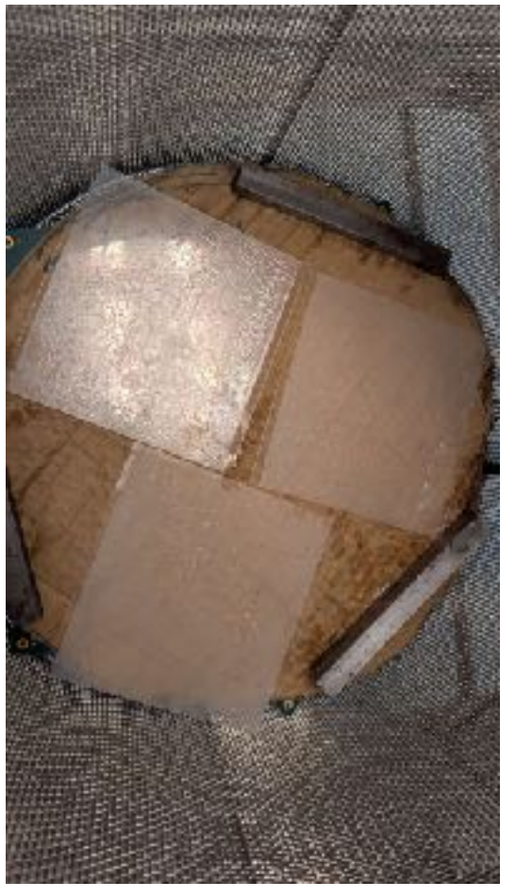







Thermal stress test (horizontal)

- **Horizontal dipping test**
  - Simulation of the horizontal mount PD module immersion process
  - Almost exactly the same step as vertical, just with longer cooling time on top of LN2 for ~ 2 hrs
  - The immersion process is imminent when touching the LN2 surface



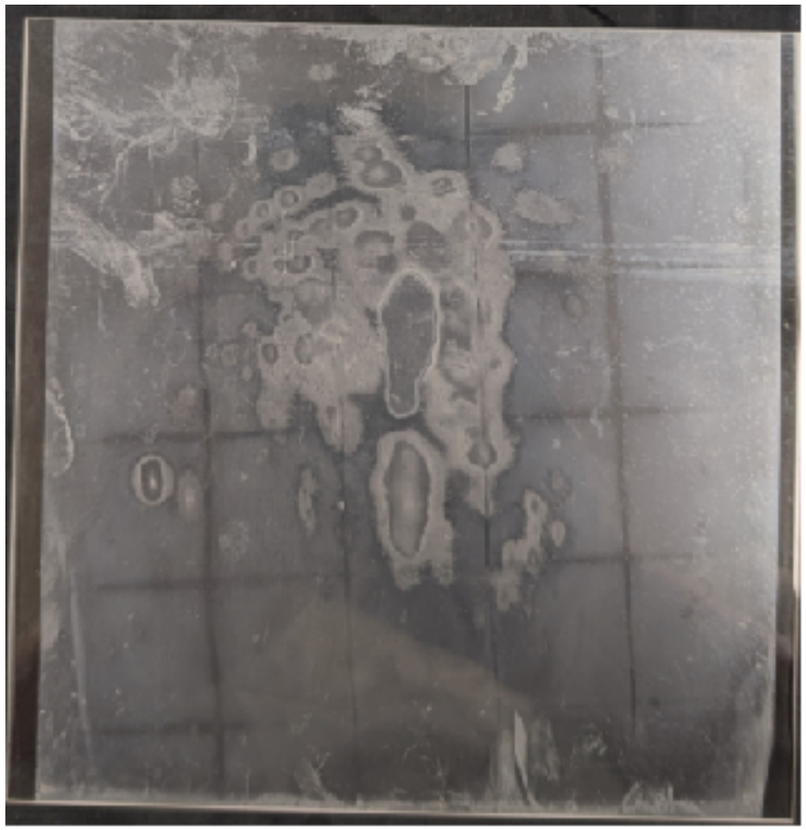



Thermal results and observation

- All substrates survived the thermal stress test with the controlled slow cooling process
- Significant changes on the coating after the cryogenic cycle
  - Most significant on Sapphire, least impact on B33
- Water gets under the coating during warming up

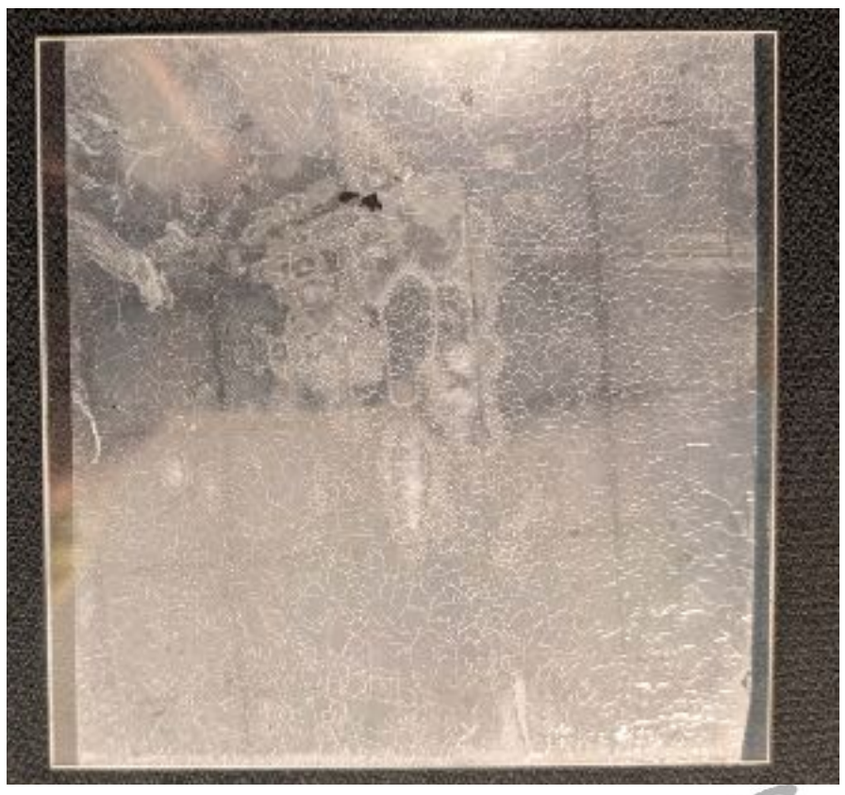
S4 Sapphire

Before



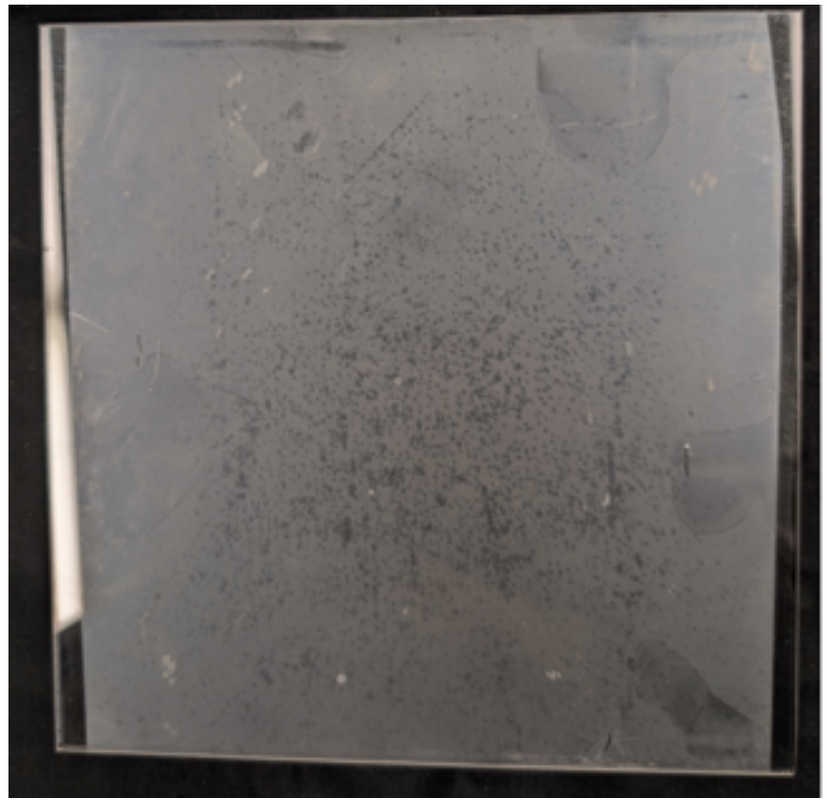
1st cold

2nd cold

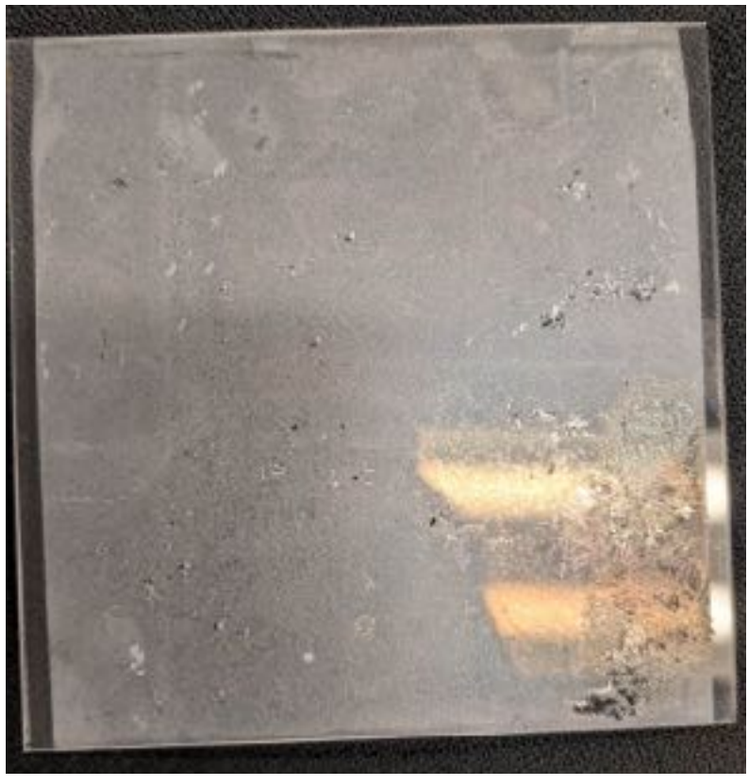


S28 Quartz
Line 5 B33

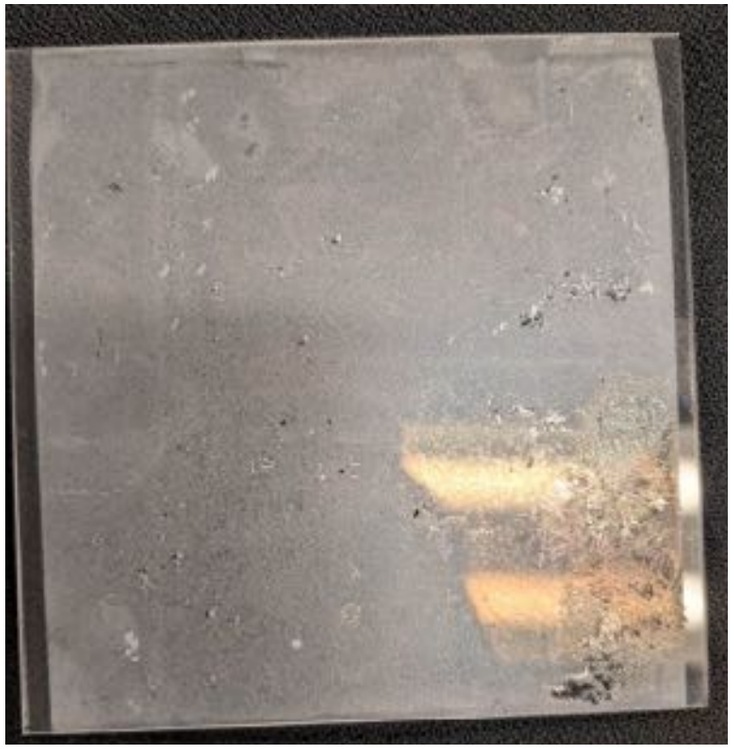
Before

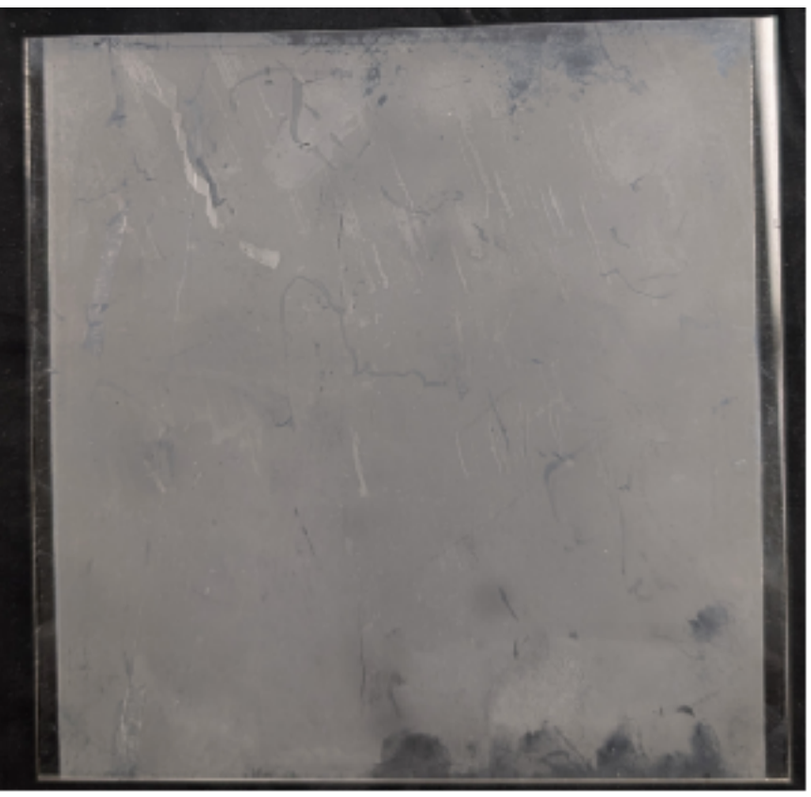


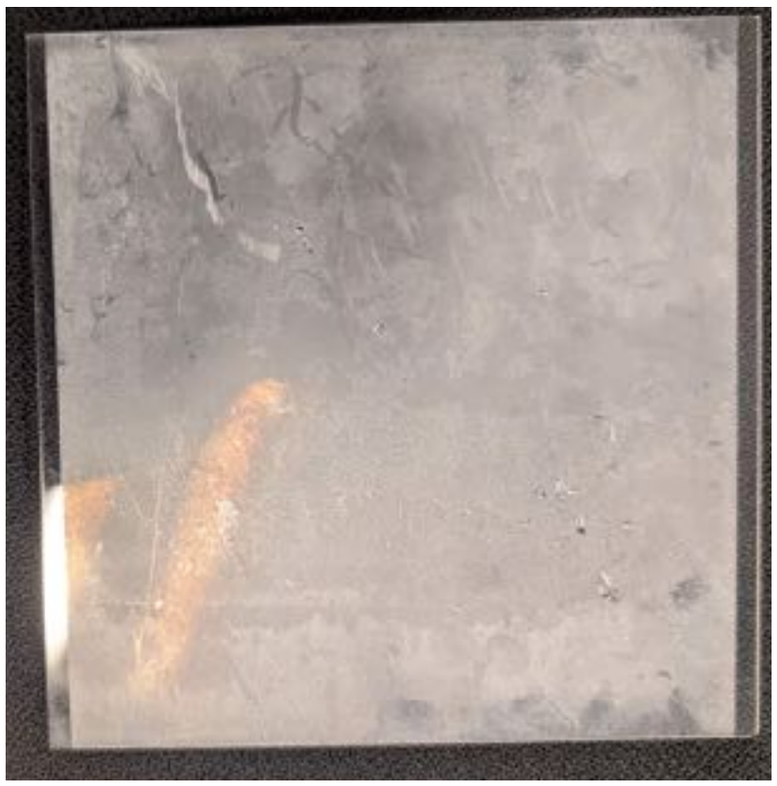
1st cold

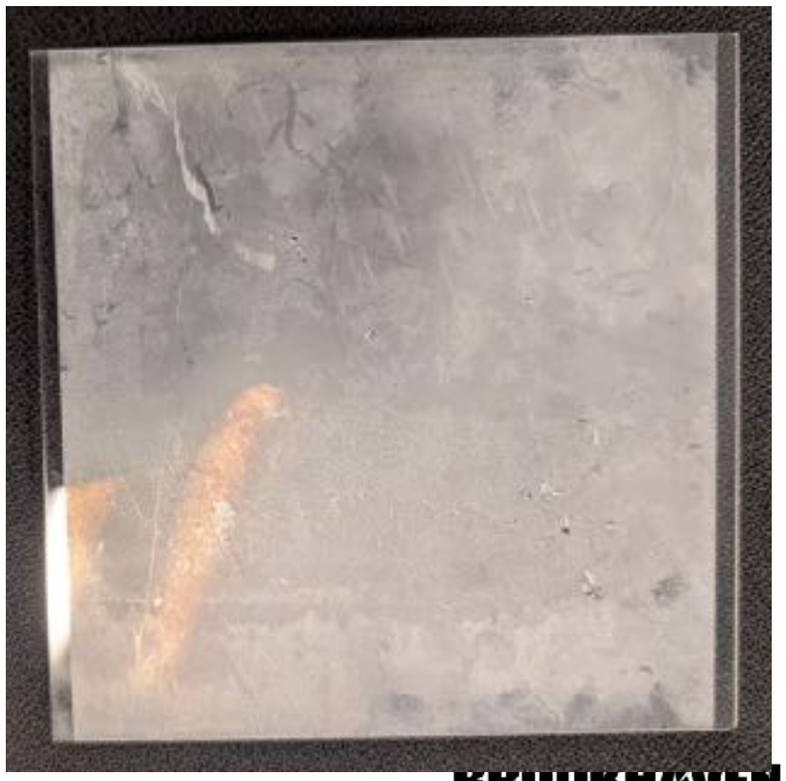


2nd cold



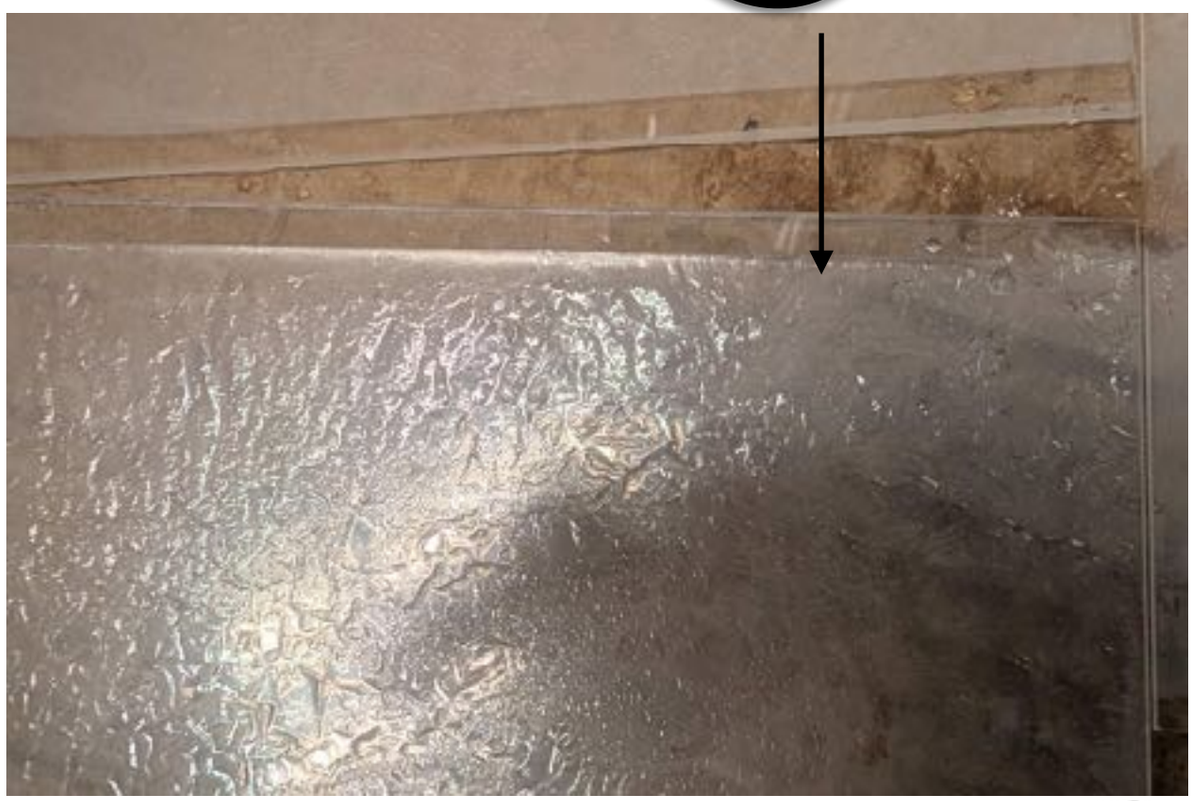






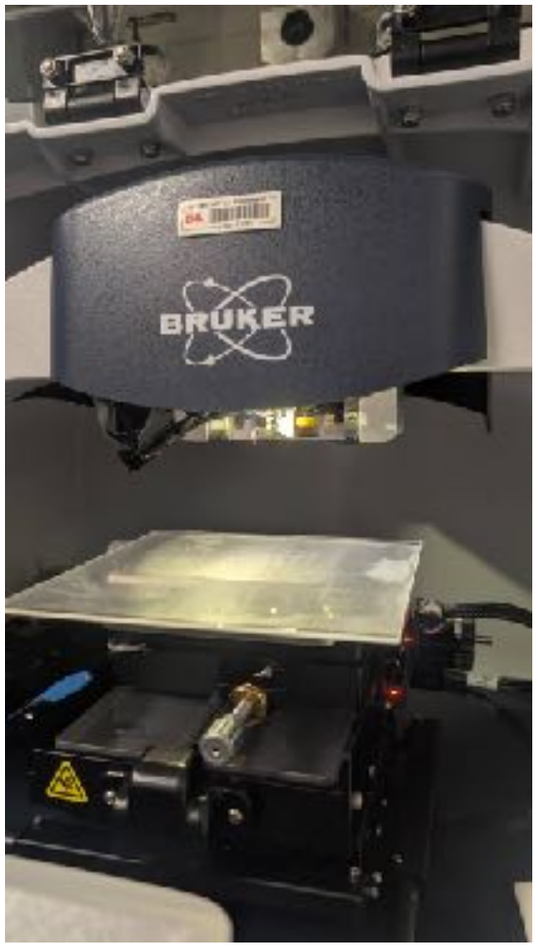
S28 Quartz

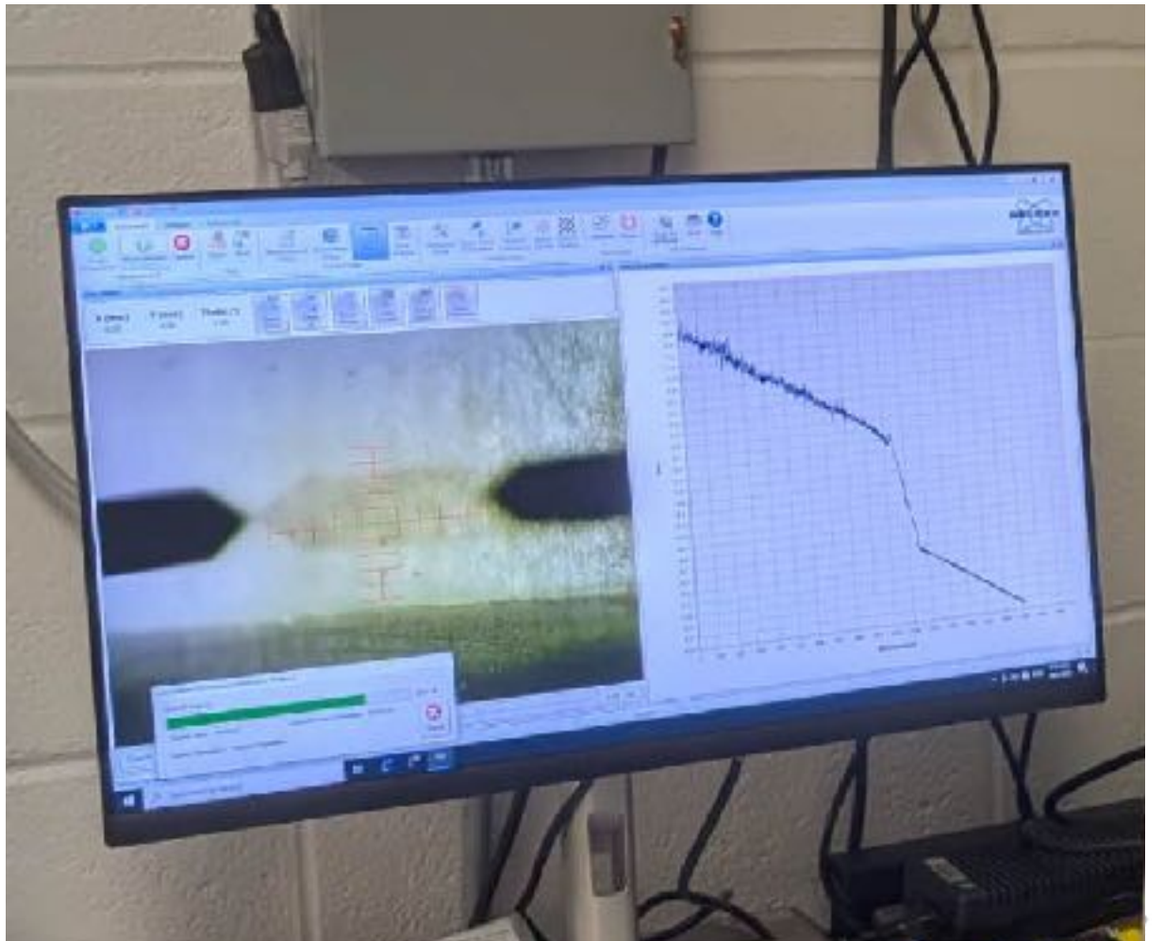
S4 Sapphire



Thickness measurement with profiler

- **Coating thickness measurement using profiler at IO**
  - I learned the operation of the profilometer from Abdul
  - Now I can conduct the thickness measurement independently
  - Principle of operation
    - It is using a diamond probe with very little pressure on the surface ~ 3mg for the scanning
    - It is a differential measurement that requires a step
    - The the results requires a surface flatness correction(done by the software)

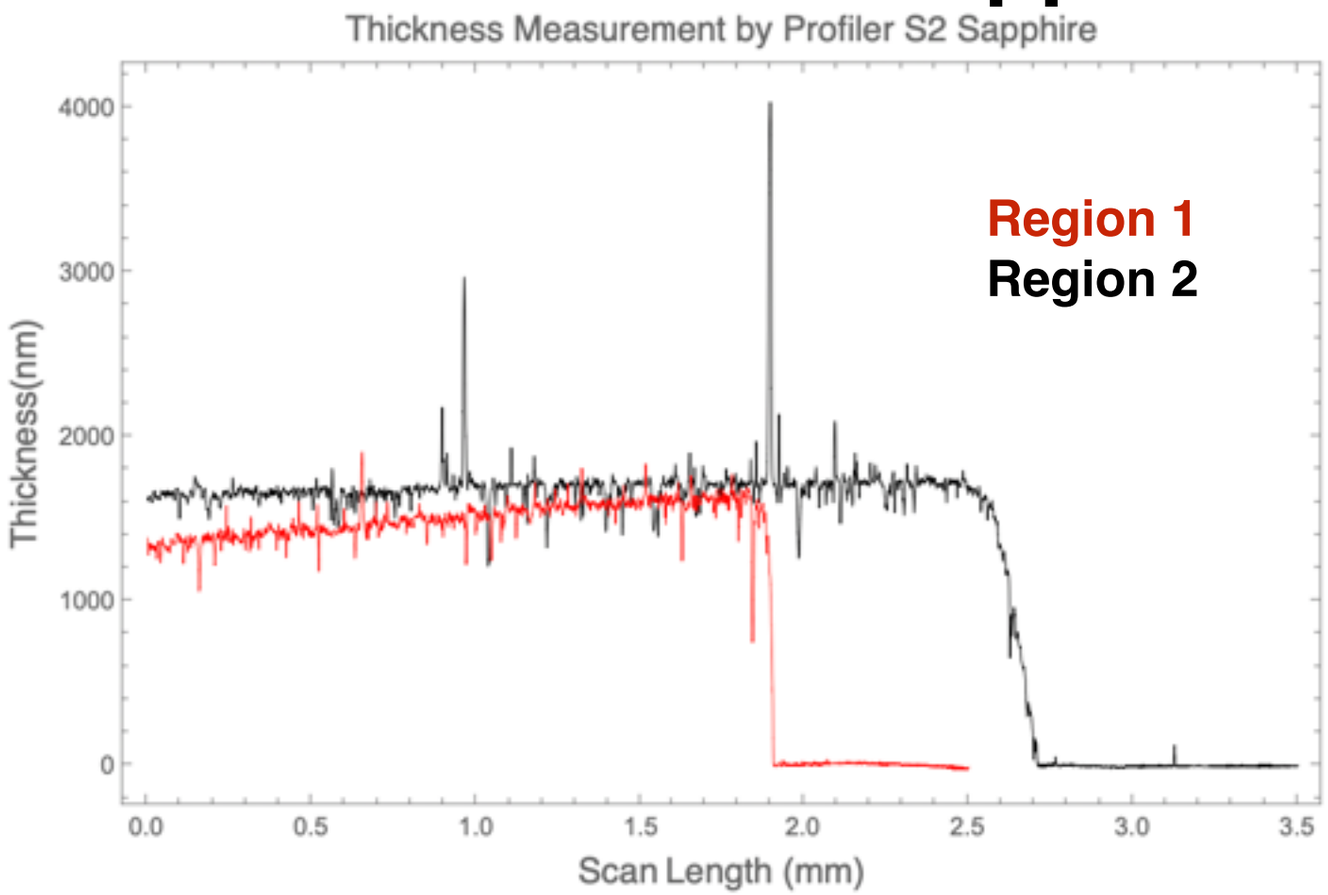


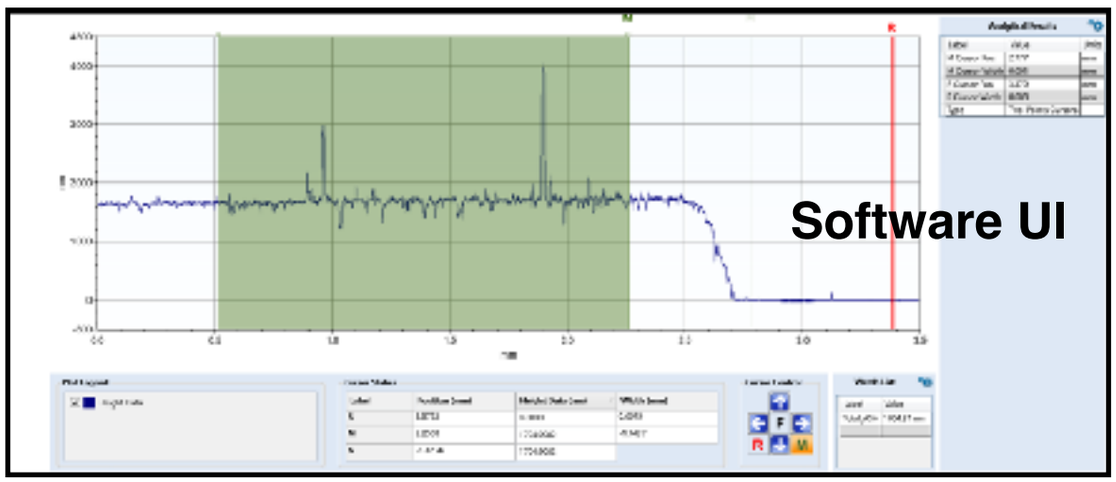


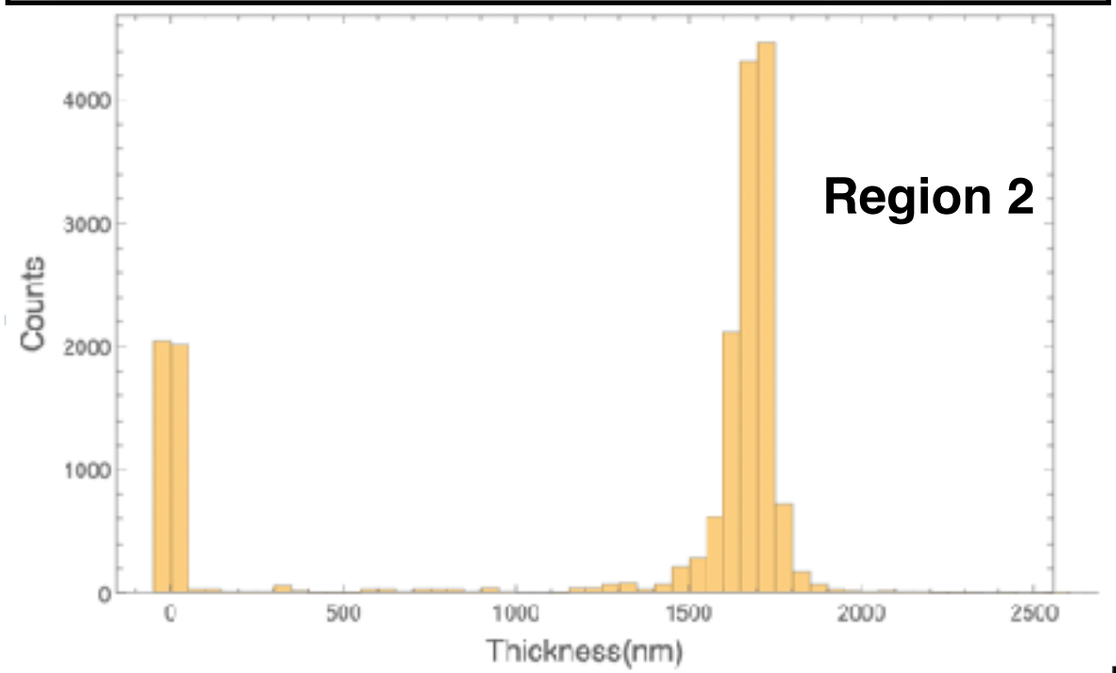
Thickness measurement results

- I practiced the measurement on 3 samples with different substrates
- Scanned on multiple locations on the sample

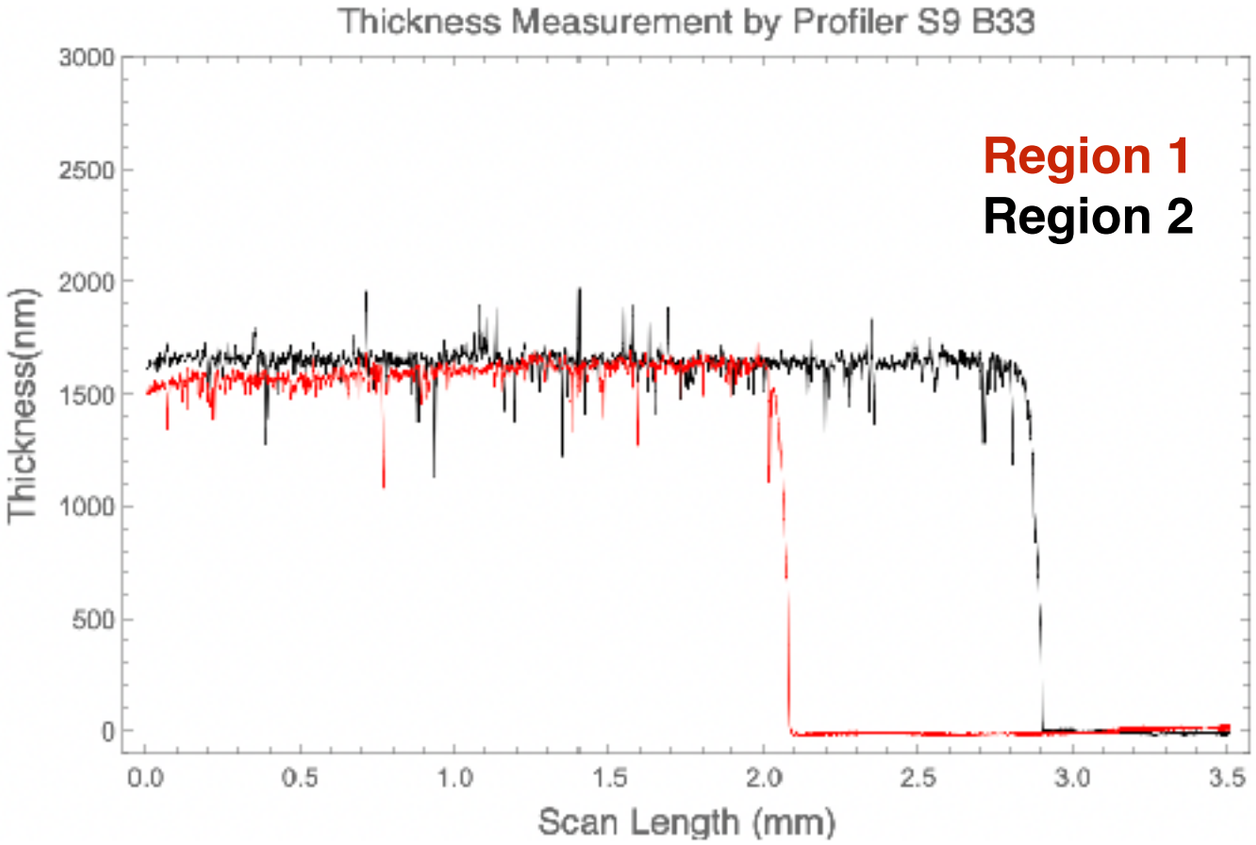
S2 sapphire

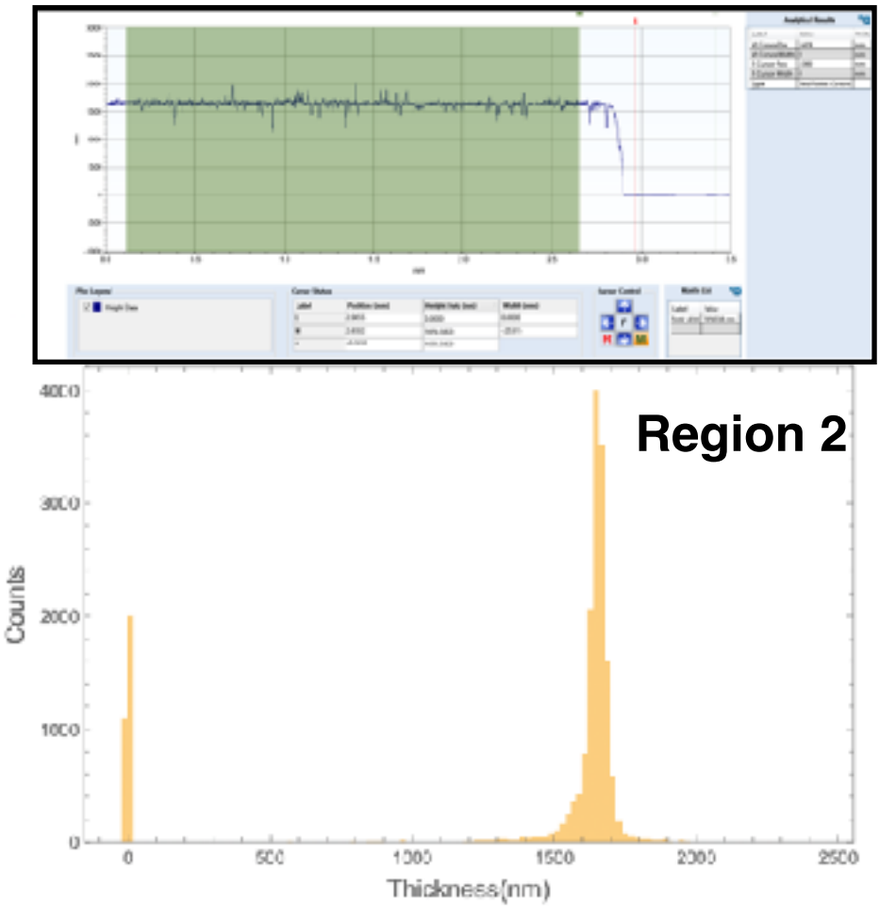






S9 B33





S21 Quartz