Mirror Thermal Testing

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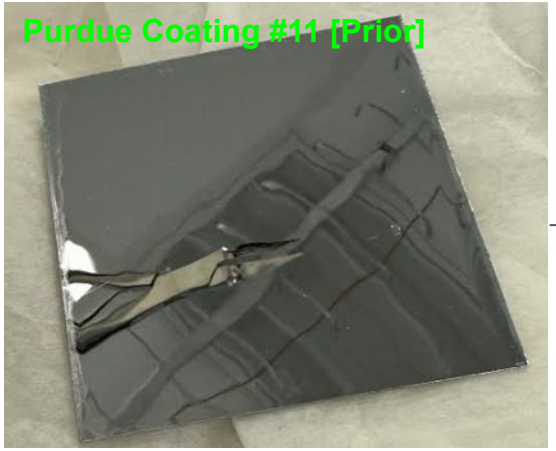
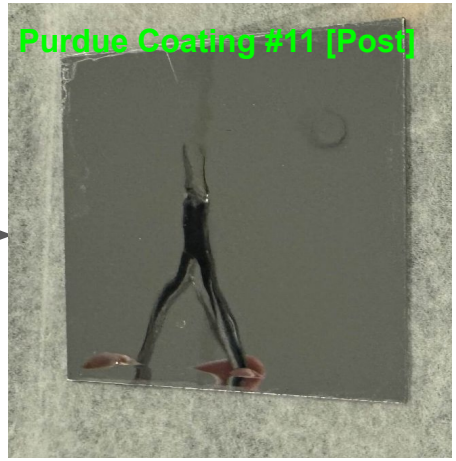
Initial Thermal Testing

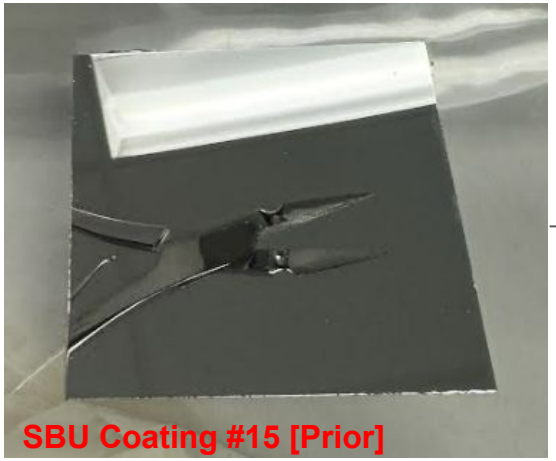
- “Test 0” for mirror thermal capabilities, using 1 Stony Brook produced mirror substrate and 1 Purdue produced mirror substrate.
  - ➢ Approximately equal coating thickness and peak reflectivities (89%): from evaporations 11 and 15 respectively.
- Aimed to better understand the use/programming of the climate chamber as well as notice any blatant distortion and damage from the heat treating.

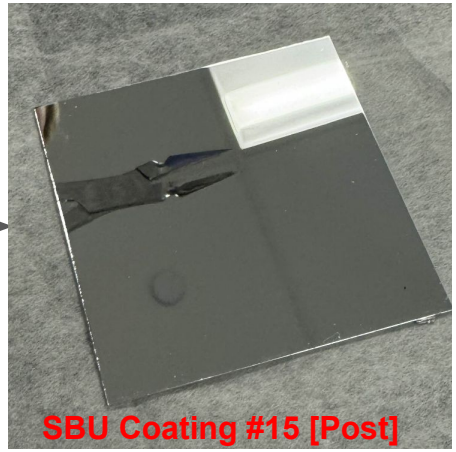
Ramping Rate	**3℃ / min**
Peak Temperature	**60℃**
Soak Time [at peak]	**2 Hours**
Total Test Time	**~ 2.5 Hours**

Visual Results:









- As we were unable to immediately reflectivity test the samples, we aimed to assess any changes to substrate shape or obvious film damage.
- At 60℃, neither the Purdue produced nor the Stony Brook produced sample showed noticeable change.
- Initial observation leads us to believe, it may not be necessary to begin thermal testing at low values
  i.e. < 45 ℃

Strawman Protocol:

- Preliminary visual inspection of mirrors to identify locations of existing waviness or damage + Reflectivity measurement prior to heating.
- Placement: A small fixture with alligator clips already exists within the chamber, this attempts to provide even coverage to both the carbon fiber and the coating. Noting the orientation in which the mirror is placed into the chamber along with pictures of existing damage would be relevant at this step.
- Initial ramp up: staying consistent with 3℃ / min, until a more accurate number is provided.
- Peak Temperature + Soak: Reaching the plateau temperature of… 50℃, 55℃, 60℃… with approximately 2-3 hour soak time (longer periods may be more relevant as we approach the upper limit).
- Removal: After re-acclimating to room temperature with a ramp down @ 3℃ / min, remove the mirrors and re-inspecting for new instances of waviness/deformation. Subsequent reflectivity test of the sample to compare to initial results.

Some Thoughts:

Introducing a temperature sensor for both the carbon fiber section as well as the coating for precise readings of the substrate temperature rather than just the surrounding air. Testing different delta_t as well as what temperature the sample entirely degrades would be relevant for future tests.

The mount can support two samples, one sample can be kept throughout all the tests to see if any structural damage occurs from the heating and cooling of the film/substrate, while the other is replaced with a new sample every test. When testing a curved substrate, it may be relevant to see if it holds the exact shape / radius throughout heating (some instrument to measure this?)