Recent Mirror Findings + Timeline

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Reminder of visual analysis:

- As mentioned at last week's meeting, Yongxin went back and examined dark spots in older samples. Earlier samples do not display this effect, beyond sample 41 we continue to see this dark spot effect.

- We mentioned we had only seen this effect in DP460 samples..

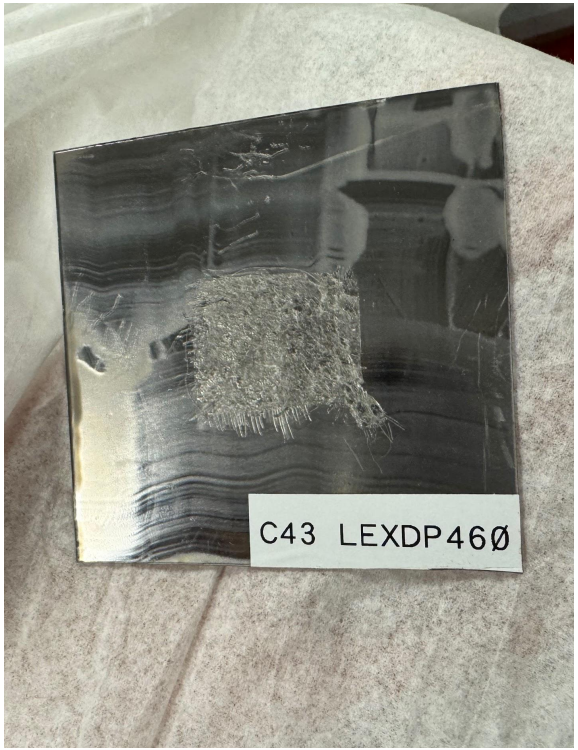
sample	conclusion
28	**no dark areas for all**
29	**no dark areas for all**
30	**no dark areas for all**
31	**no dark areas for all**
32	**no dark areas for all**
33	**no dark areas for all**
34	**no dark areas for all**
35	**no dark areas for all**
36: Ion Cleaned	dark areas on m2
37: No Ion	**no dark areas for all**
38	dark areas on m1, m4 and m5
39	dark areas on m1 and m2
40	dark areas on m5
41	dark areas on m6

What are dark spots?

- After viewing all recent samples together at BNL we came to a better understanding about dark spots. They are **NOT exclusive to DP460**, Purdue substrates also show them.

- We previously stated 1 lexan piece also showed dark spots. After viewing this in person, the back of the lexan had epoxy on it (this was meant to be a transmission test). **NO other lexan shows dark spots in any test including coatings where other samples (non bare lexan) have dark spots.**

- **We are extremely confident, this dark spot is actually seeing epoxy under the lexan**. Purdue having a more uniform epoxy method makes the entire 7x7 sample look like a dark spot. This made identifying it earlier more difficult (but light spots can be seen on edges where there is little to no epoxy)

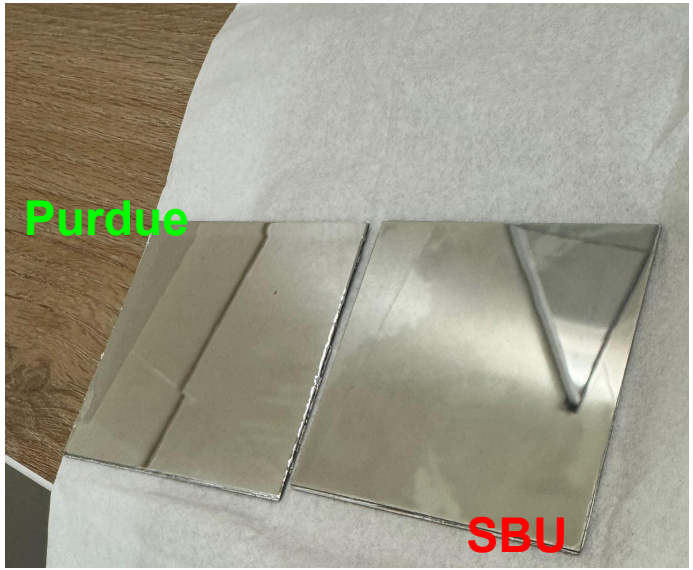


What can we do about it?

- We conclude (barring C43 LexDP460) that **lexan only does not have dark spots**. Light is transmitted through the reflective coating, and would typically be reflected back by the lexan layer, the thick epoxy instead absorbs a fraction of this light which has resulted in these frequent 85% coatings (testing dark spots vs light spots is on avg a loss of 4-5%).

- We must simply coat slightly thicker, too much aluminum causes some interference issues with transmitted light, but if we can make the coating thick enough that the epoxy does not play a role, then recouping the lost reflectivity from the epoxy will make up for any fractional losses by adding too much aluminum. We can then optimize from there and return to our 90% reflectivity from coating #28.

- Aging of our last QC likely means we were not receiving an accurate reading, after replacing this crystal, we are aiming for the same relative number but it is not actually the same absolute value.



Timeline

Two coatings in the week of 6/30 [ALL future coatings will have, 1 lexan only sample, 1 lexan sample with epoxy painted on the back] :

- An initial coating with slightly increased aluminum e.g. 20 kA, with this we can aim to lessen dark spots, if they're still visible we will coat more, if not we will coat slightly less.

- A secondary coating immediately after depending on the visual results of c47.

    - Note, SiO_2 was recently tested in an extremely thin layer (1 kA), we found this prevented superficial scratches but not enough for the purposes of cleaning with wipes (dust is easily removed, but small pieces of C.F. flaked off from the side of the substrate and would create scratches when wiping. Eventually this will be retested at ~ 2 kA but is not pressing. We are looking into ethanol baths pre and post coating to alleviate dust / pitting.

Summary:

- We also conclude that our working recipe is sufficient to 91% for Lexan only substrates (proven over multiple samples in different coatings) but slight optimization is necessary to allow for epoxy, this should require 1-2 weeks.

- An uncoated large scale mirror is being sent to BNL (07/01) to help calibration the test stand. Our large scale mirror coating will be heavily inline with the test stand being ready (± 1 week)