Evaporation Update

- The third evaporation test was conducted with Lexan samples backed by Carbon Fiber. Went relatively well with it being notable that the thin lexan samples had a wavy appearance to the eye while the standalone lexan and 30ml did not have this trait.

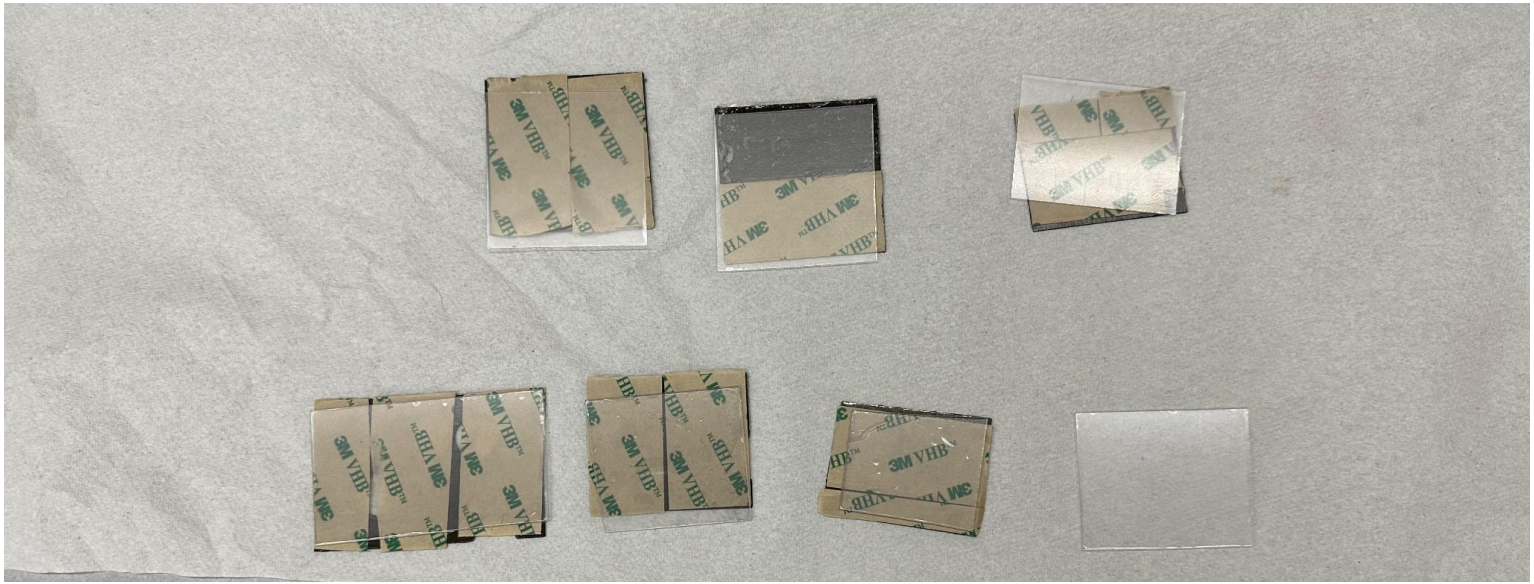
- Reflectivity test for the lexan, one 30 ml and one 10 ml, has been conducted by Kong and Sean at BNL. Promising results, 90% reflectivity for 10 ml between 400-700 nm.

- Future evaporations we plan to regulate the mass in the crucibles to reduce the chance of overfilling, working with new crucibles for less irregularity in coating, further refining the amount we are depositing and gaining a better understanding for the current/rate relationship. As well as doing a larger scale sheet of lexan opposed to the smaller samples that have been done so far.

- The reduced adhesive worked well and we will be designing a new conical mirror to test in the system as well as new mounting since the current one is ill-equipped for samples larger than ~6-7 inches. A question regarding how important the raster pattern is since it leaves a lot of material unevaporated, remains to be answered.

Set Up:

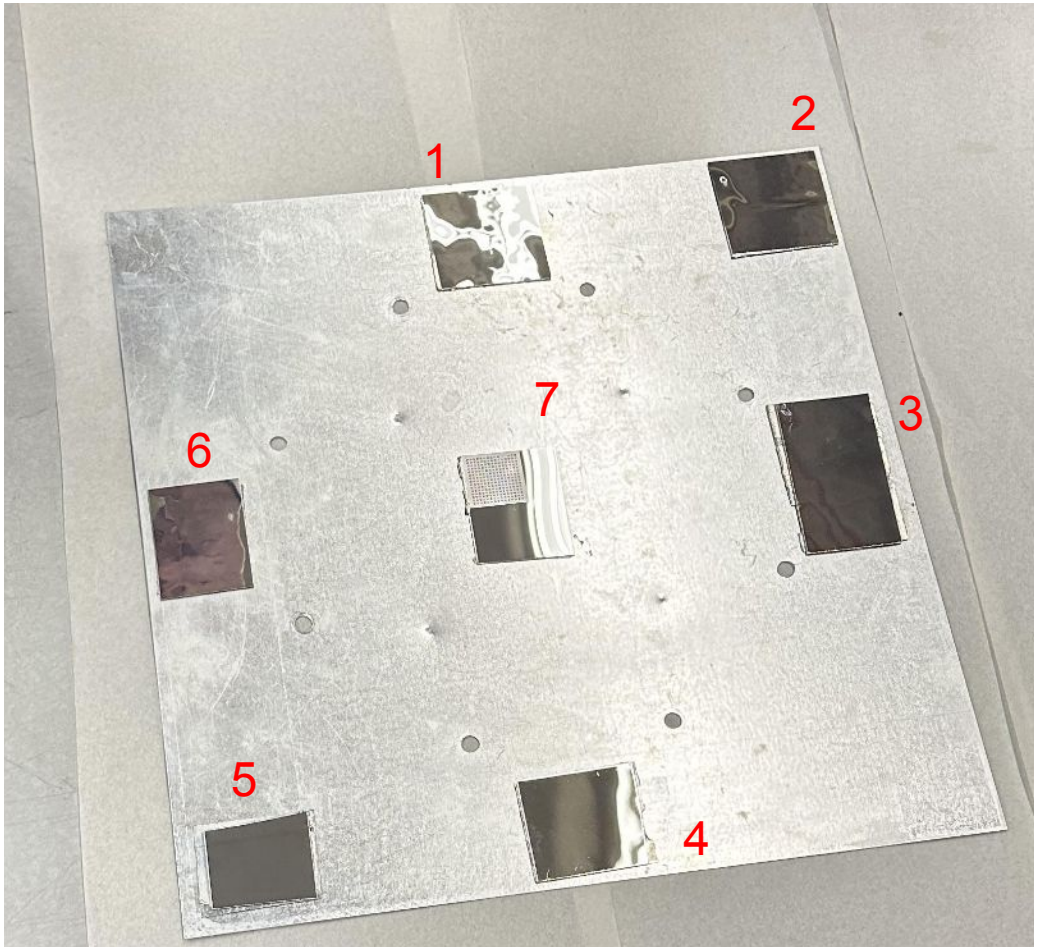
We evaporated 7 samples, 6 of which are backed by carbon fiber: 3 with thick 30 ml lexan, 3 with thin 10 ml lexan. The last sample is a standalone 30 ml lexan piece that was placed in the center of the set up to test the discrepancy between coatings at the edge vs middle.



Results:

The samples were coated with 13.2 K Angstrom of Cr, an 18% reduction from evaporation 2. As well as a total of 63.5 KAng of Aluminum, an 11% reduction of material. To the eye, it is very apparent that the thin mirrors (1,2,6) have this “wavy” texture, whereas the thicker lexan (3,4,7) does not suffer from this issue.

The intention is to reduce the Cr and increase/keep the Al the same, as a result of inconsistencies due to crucible age, this became difficult to stick to during the evaporation process.

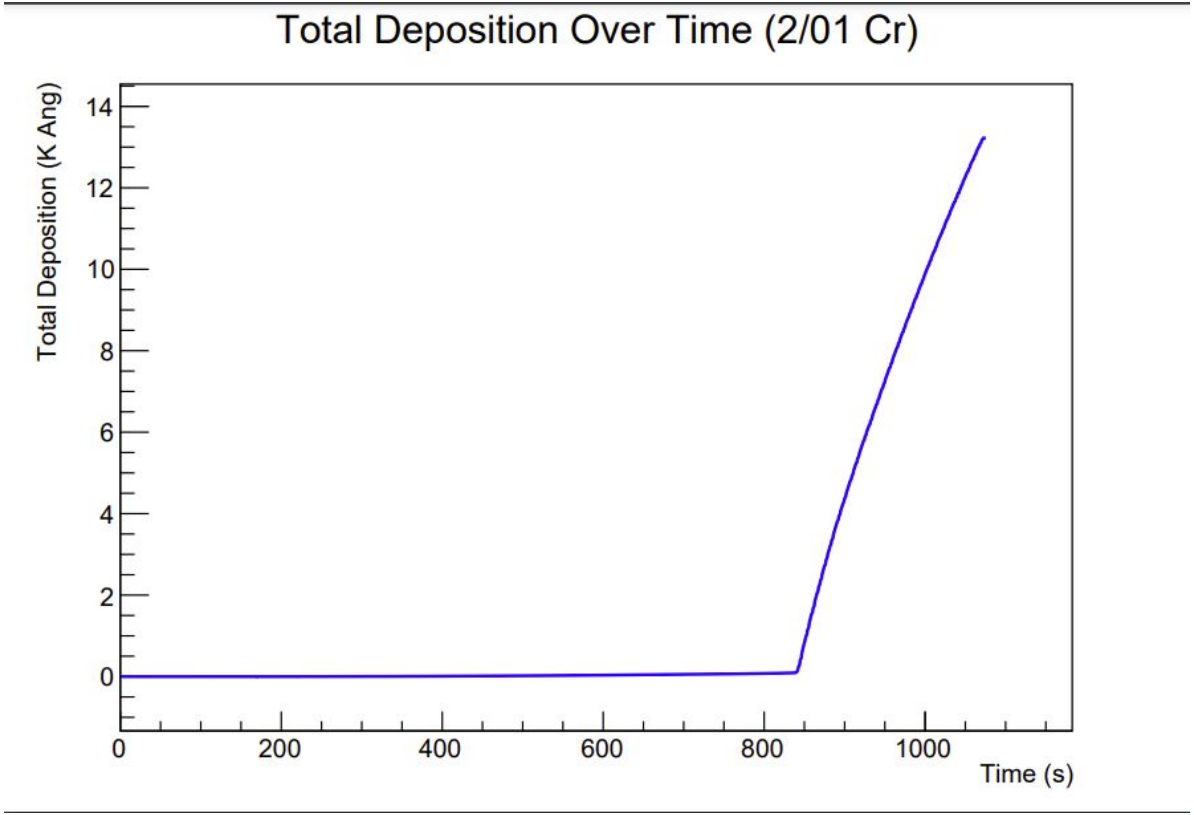


Notes + Data:

We intend to continue fine tuning the amount of material we deposit and finding the correct ratio between Cr and Al in future evaporations (notably the new crucibles did not have any mass loss at 120 mA, ~0.3 Ang/Sec, where old crucibles have had a rate of ~100 Ang/Sec at the same current value. This inconsistency resulted in some a shorter amount of Al deposition than intended.)

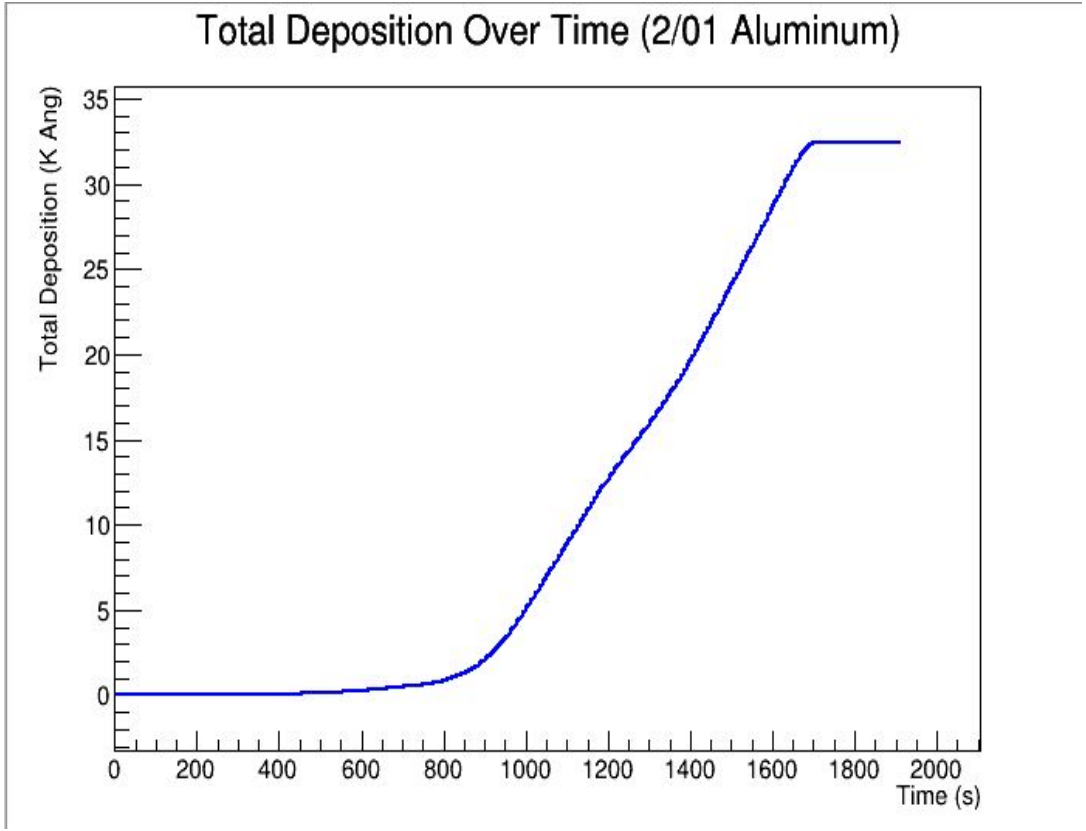
The Al crucibles were overfilled at 5.5 grams each of material making it difficult to remove the crucibles. Meaning subsequent evaporations must remain below this value in order to prevent residue from building up in the carousel of the e-gun.

Data Graphs



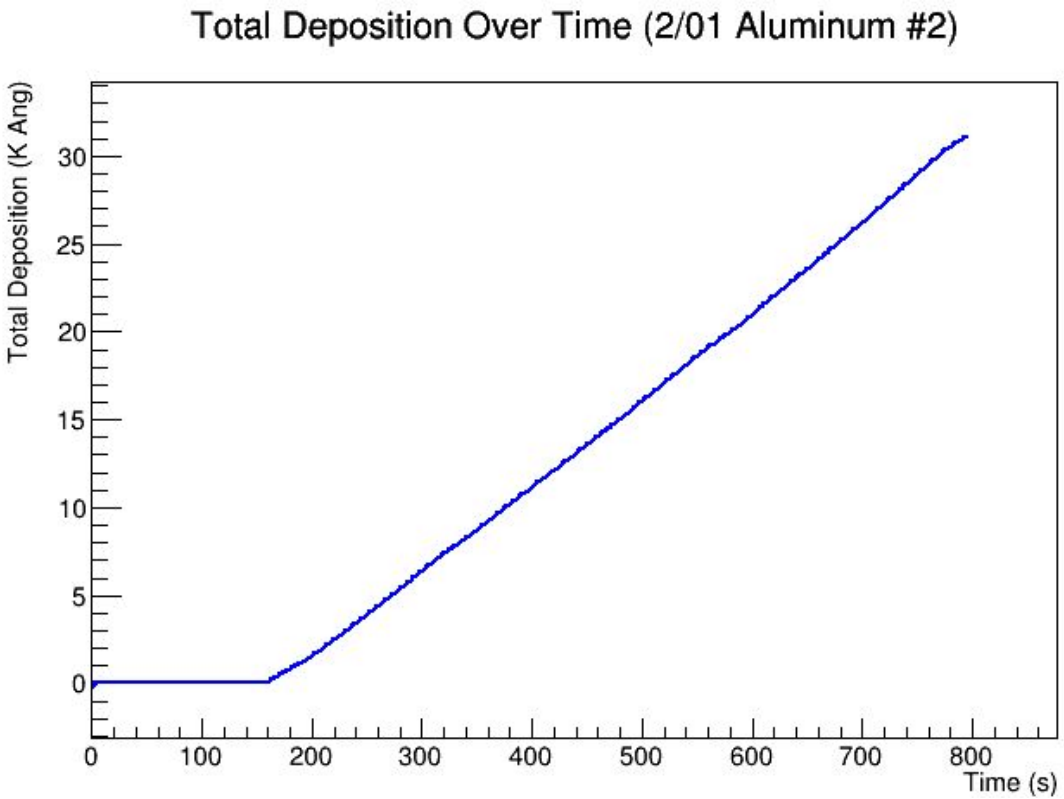
The Cr deposition went quite smoothly, the data and results resemble that of prior evaporations. A total of 13.2 KAng in ~220 seconds of coating, 17 mins 56s including crucible heating.

Al #1

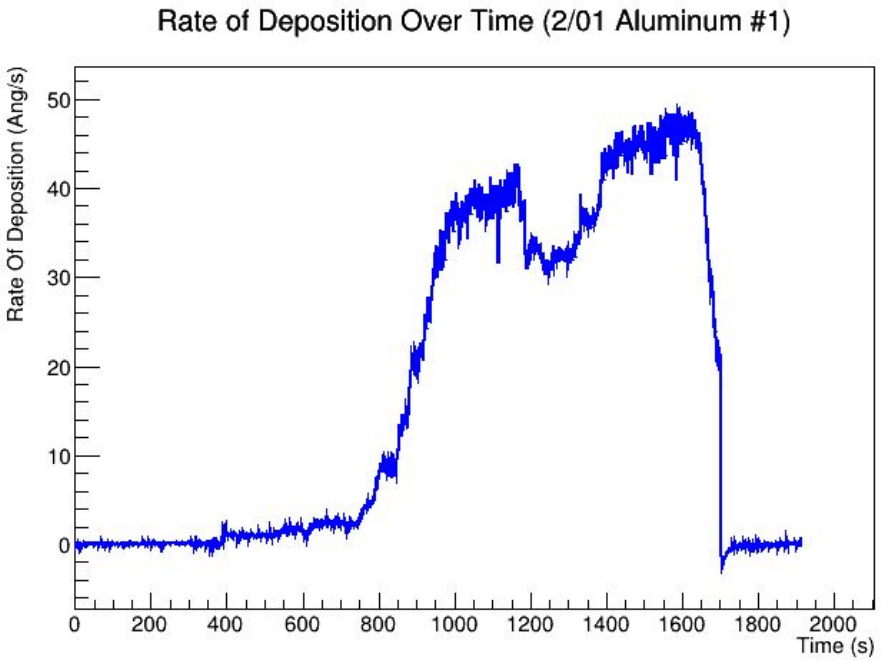


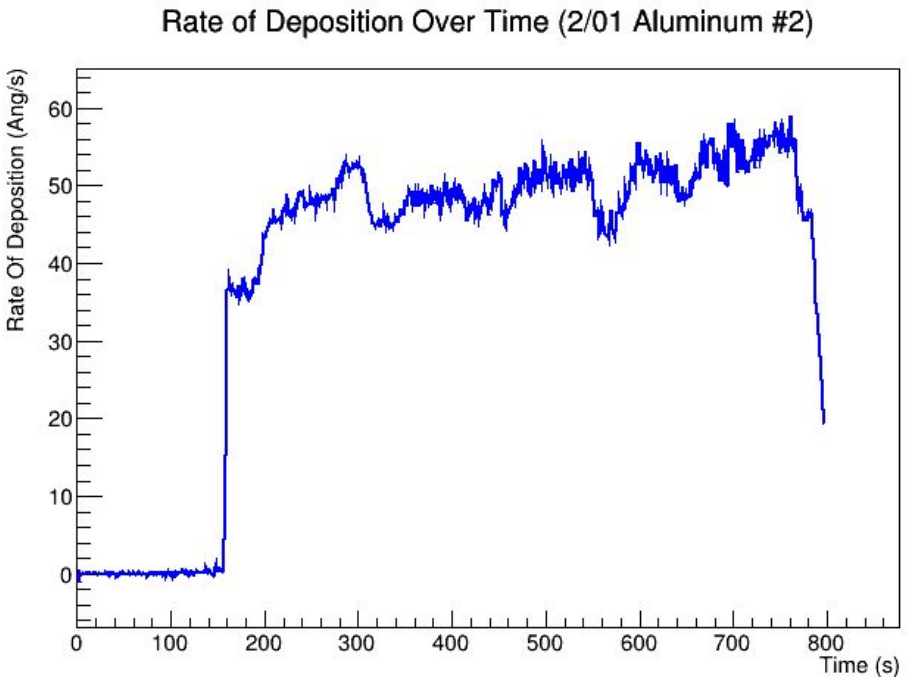
32.43 K Ang of Al were deposited from the first crucible, notably we can see the slow rise from when the shutter was opened at 6 mins into the evaporation, deposition rate was ~ 1 A/s at 120 mA and was increased to a cruising current of 180 mA for 40 A/s. This displays a major difference between the prior evaporation that was done at 100 mA for ~70 A/s

Al #2

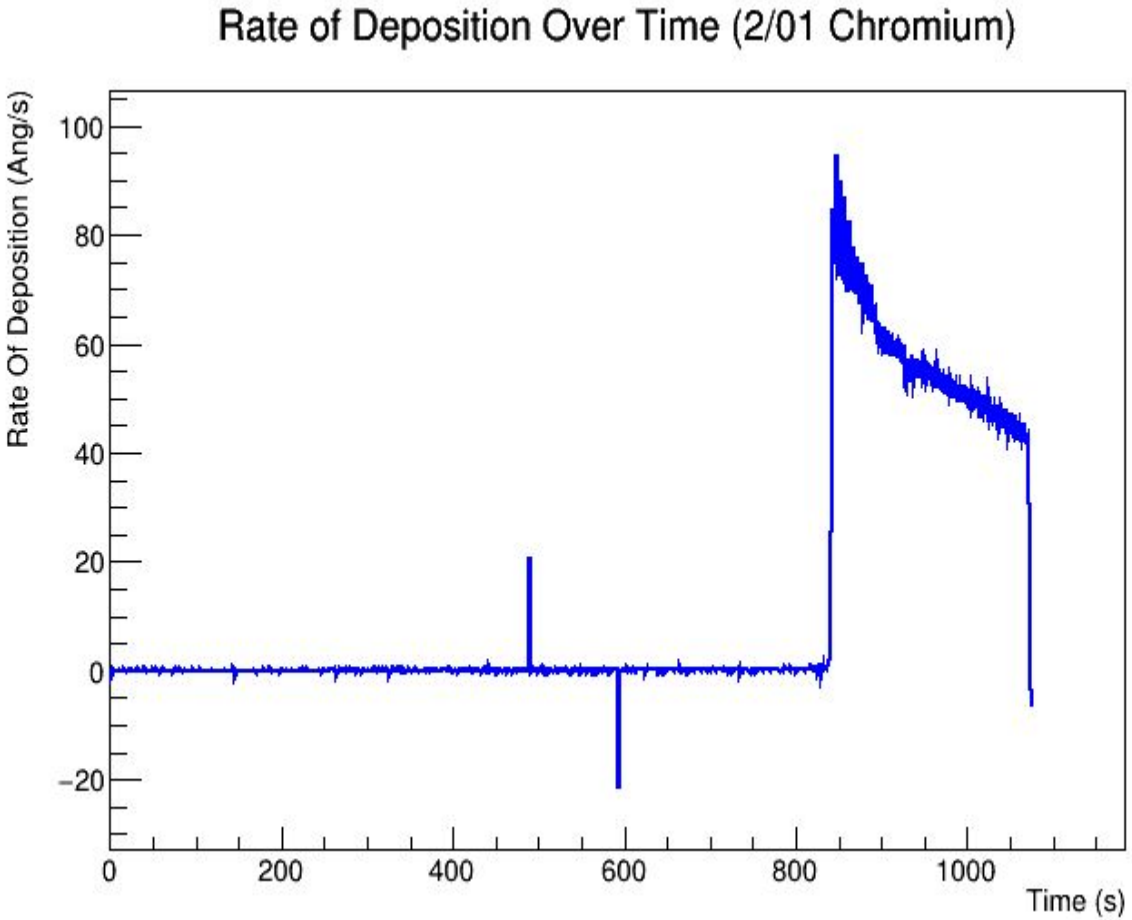


31.12 K Ang of Al were deposited from the second crucible, this deposition being the most inconsistent of the 3. Initially, this crucible was done prior to Al #1 and was noted to have no deposition at the 120 mA current. From there it was skipped, Al #1 was evaporated and we then returned to this crucible with the understanding that a higher current was necessary. At 180 mA it was the most consistent out of any previous crucible.





The rate of deposition in Ang/Sec is shown above for both aluminum crucibles, Al #1 being much longer as a working current had to be found. Al #2 stayed consistent between 40-50 Ang/Sec at 180mA where as Al #1 ranged between 30-50 Ang/Sec at 150 mA.



The rate of deposition data for Cr is relatively consistent with other evaporation besides two outlier points, one at 489 sec with 20.99 Ang/Sec and the second point at 593 sec with -21.21 Ang/Sec. Given that the shutter had not been opened they seem like systematic errors in data collection. The evaporation was conducted at 64 mA, starting at 90 Ang/Sec and rapidly decaying to 50 Ang/Sec over 3 minutes while at the same intensity of current.