

Goal:

This report documents the contrast curves for the ZEP520A electron beam lithography resist from ZEON Chemicals. Dilution by weight of ZEP520A vs spin speed from 1000 to 6000 rpm was generated for this work and can be found at http://repository.upenn.edu/scn_protocols/31/. The aim is to provide an approximate clearing and base dose for the ZEP520A standard process at the Singh Center for Nanotechnology.

Materials:

- ZEON Chemicals ZEP520A at various dilutions
- 3" Si wafers
- Two clean beakers large enough to develop a 3" wafer
- O-xylene
- Isopropyl Alcohol (IPA)
- Timer
- TexWipe

Equipment:

- ReynoldsTech Spinner
- Torrey Pines Scientific Hotplate
- Filmetrics F40
- Elionix ELS-7500EX Electron Beam Lithography (EBL) Tool

Protocol:

Spin Coat and Soft Bake

1. Mount wafer and ensure that it is centered on the ReynoldsTech Spinner
2. Spin wafer at a fixed RPM for 60 seconds.
3. Bake wafer at 180 °C for 90 seconds and allow wafer to cool after removal.

Exposure

1. Generate an array of 60 micron by 60 micron square in a dose matrix on a 100 micron pitch.
2. Using the Elionix ELS-7500EX EBL tool, expose the pattern using 100pA with a 30 micron objective lens aperture (OLA, a.k.a. final aperture).

Development at ~20°C

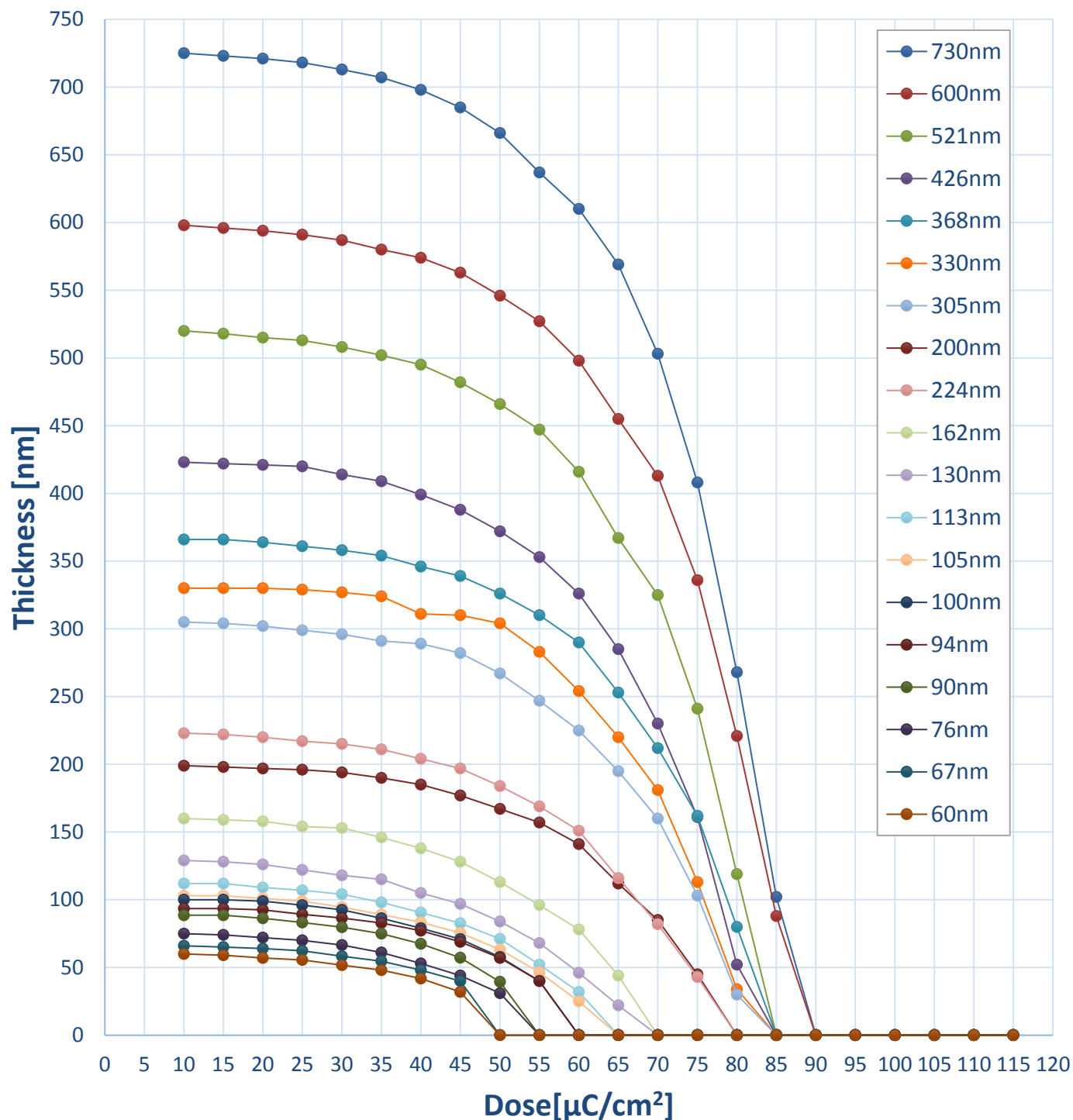
1. Pour o-xylene into the first clean beaker.
2. Pour IPA into the second clean beaker.
3. Set timer to 70 seconds.
4. Drop exposed wafer into bath of o-xylene making sure the wafer is completely submerged, and start the timer. Do not agitate.
5. After 70 seconds submerge the wafer into the IPA bath to stop development.
6. After roughly 30 seconds remove the wafer and place on a TexWipe.
7. Blow dry the wafer with N₂.

Measurement

1. Allow the Filmetrics F40 light to warm up for at least 5 minutes.
2. Click *Baseline...* to calibrate the tool using the SiO₂ and Si standards.
3. Mount wafer and select the *ZEP520A on Si* recipe.
4. Measure the resist thickness at the center of each square.

Results:

Development: 70s O-xylene, 30s IPA Bath Rinse, N₂ Blow Dry



Pads were exposed to $115\mu\text{C}/\text{cm}^2$. Data has been truncated for formatting purposes.

Dose [$\mu\text{C}/\text{cm}^2$]	Resist Thickness								
	730nm	600nm	521nm	426nm	368nm	330nm	305nm	224nm	200nm
10	725	598	520	423	366	330	305	223	199
15	723	596	518	422	366	330	304	222	198
20	721	594	515	421	364	330	302	220	197
25	718	591	513	420	361	329	299	217	196
30	713	587	508	414	358	327	296	215	194
35	707	580	502	409	354	324	291	211	190
40	698	574	495	399	346	311	289	204	185
45	685	563	482	388	339	310	282	197	177
50	666	546	466	372	326	304	267	184	167
55	637	527	447	353	310	283	247	169	157
60	610	498	416	326	290	254	225	151	141
65	569	455	367	285	253	220	195	116	112
70	503	413	325	230	212	181	160	82	85
75	408	336	241	161	162	113	103	43	45
80	268	221	119	52	80	34	30	0	0
85	102	88	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0

Dose [$\mu\text{C}/\text{cm}^2$]	Resist Thickness									
	162nm	130nm	113nm	105nm	100nm	94nm	90nm	76nm	67nm	60nm
10	160	129	112	103	100	93.5	88.6	75	66	60
15	159	128	112	103	100	93.5	88.6	74	65	59
20	158	126	109	101	99	92.5	86.3	72	64	57
25	154	122	107	99	96	89.3	83.3	70	62.3	55.6
30	153	118	104	94.5	92.5	86.5	79.7	66.5	58.4	51.8
35	146	115	98	89.1	86.4	82.8	75	61	54.6	48
40	138	105	90.5	83.4	79	77.1	67.4	53	48	41.8
45	128	97	82.6	75.6	71	68.9	57.3	44	40	32
50	113	84	71.1	63.3	57.7	57	39.4	31	0	0
55	96	68	52	46.5	40	40	0	0	0	0
60	78	46	32	25	0	0	0	0	0	0
65	44	22	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0