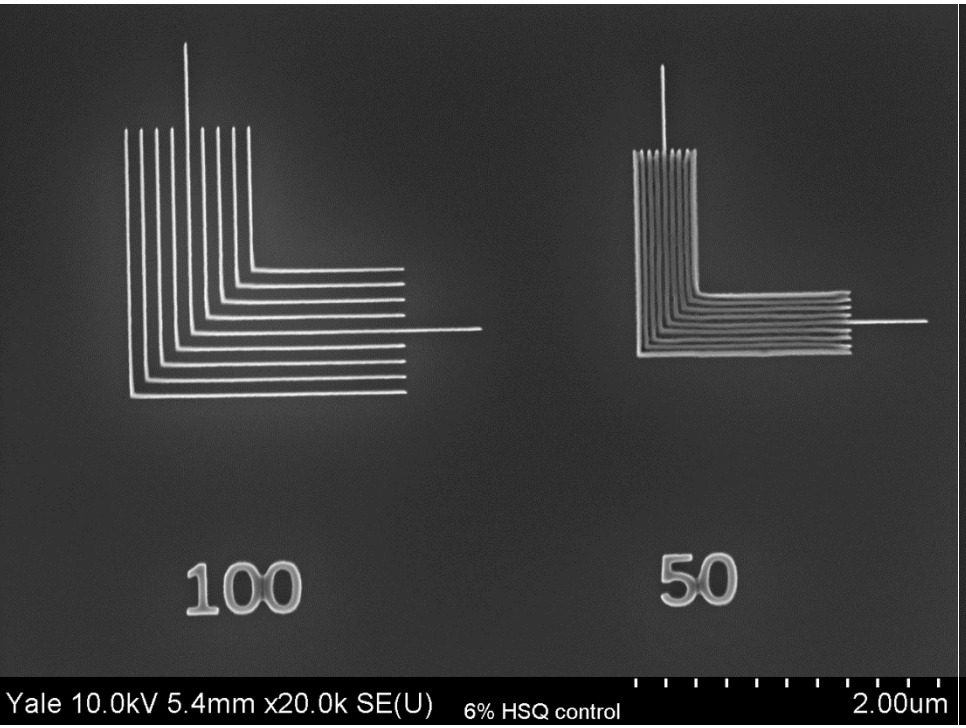
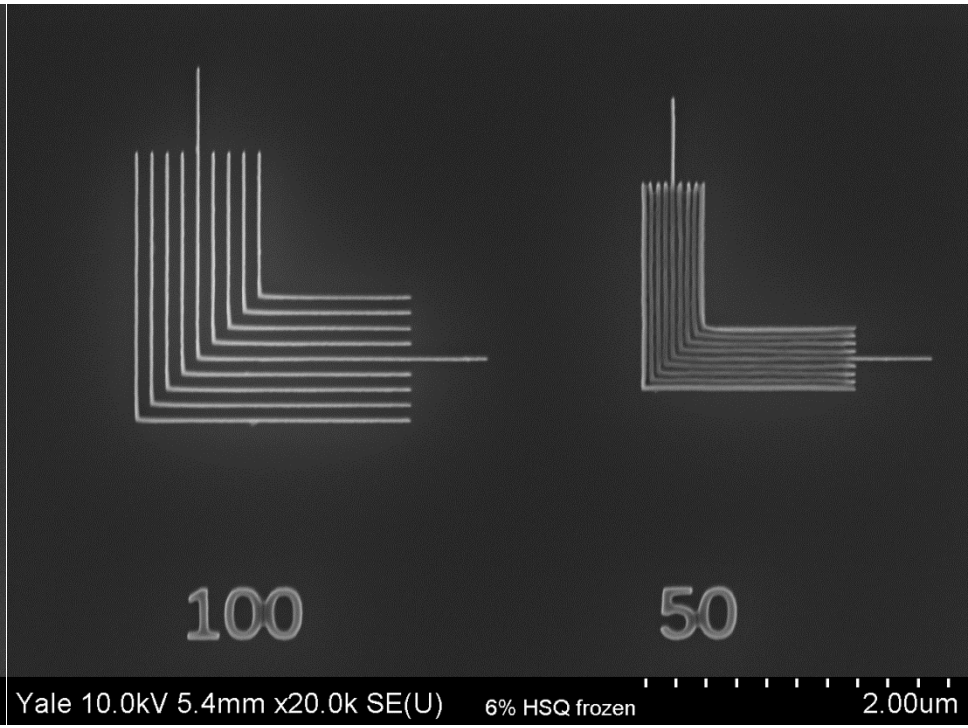
# You Can Freeze HSQ

HSQ stored as liquid, -27°C




Stored frozen at -196°C (liquid nitrogen)

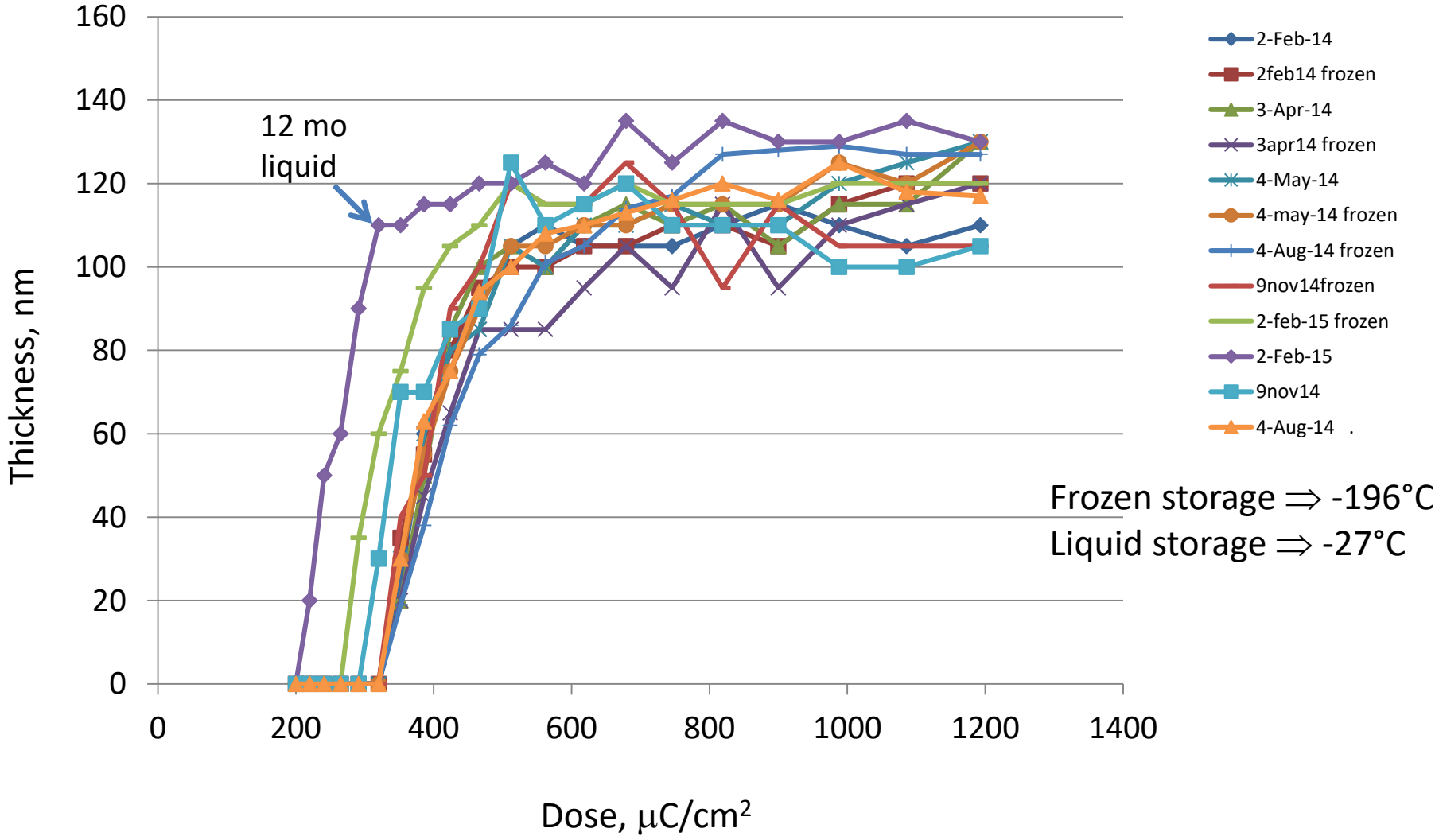



Freezing HSQ has no effect

Freezing point of MIBK = -85°C

M. Rooks, Yale University

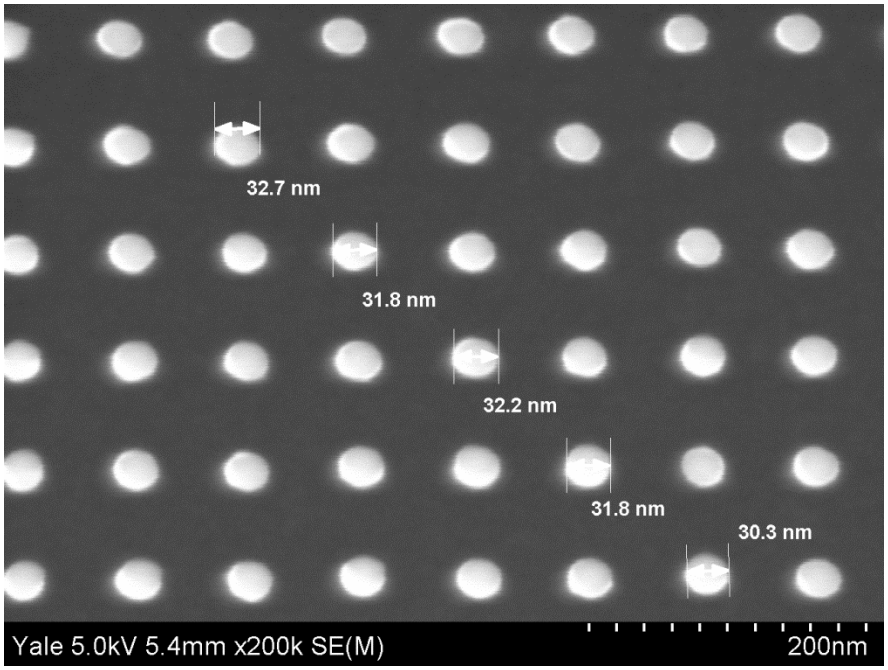
HSQ contrast, comparison of frozen to liquid storage
Critical dose drops after 12 months of storage as liquid.



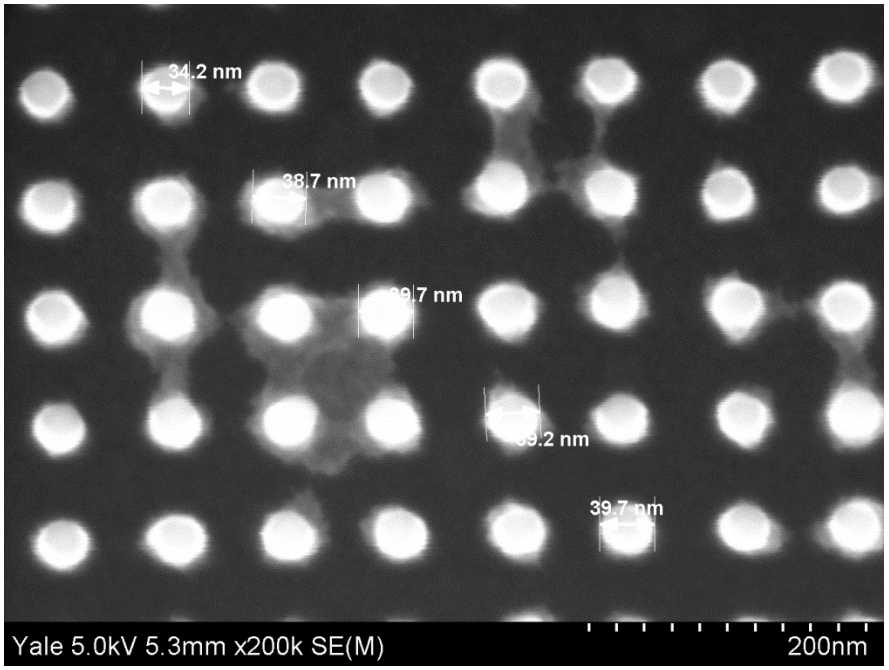

Frozen storage ⇒ -196°C
Liquid storage ⇒ -27°C

M. Rooks, Yale University

Frozen at 77°K 12 months



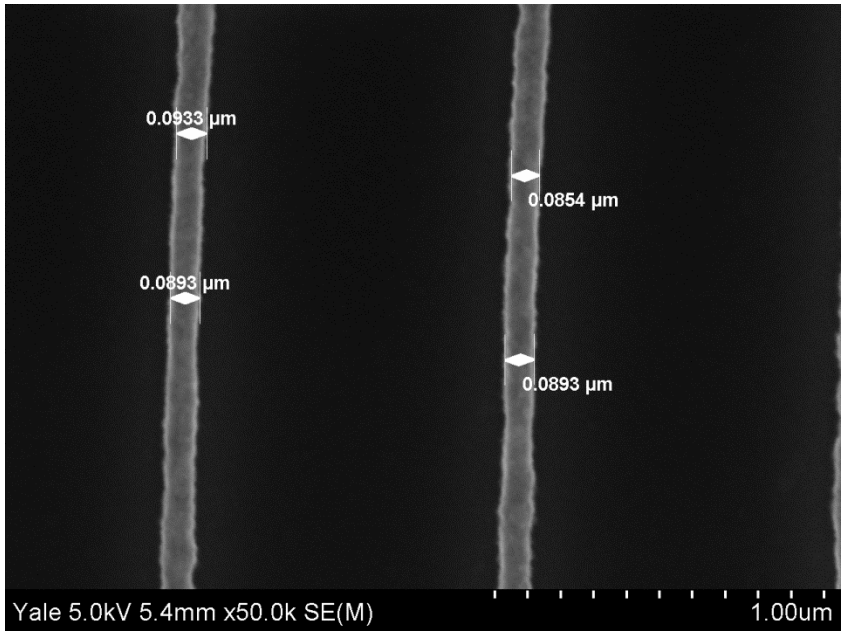

Liquid at -27°C for 12 months



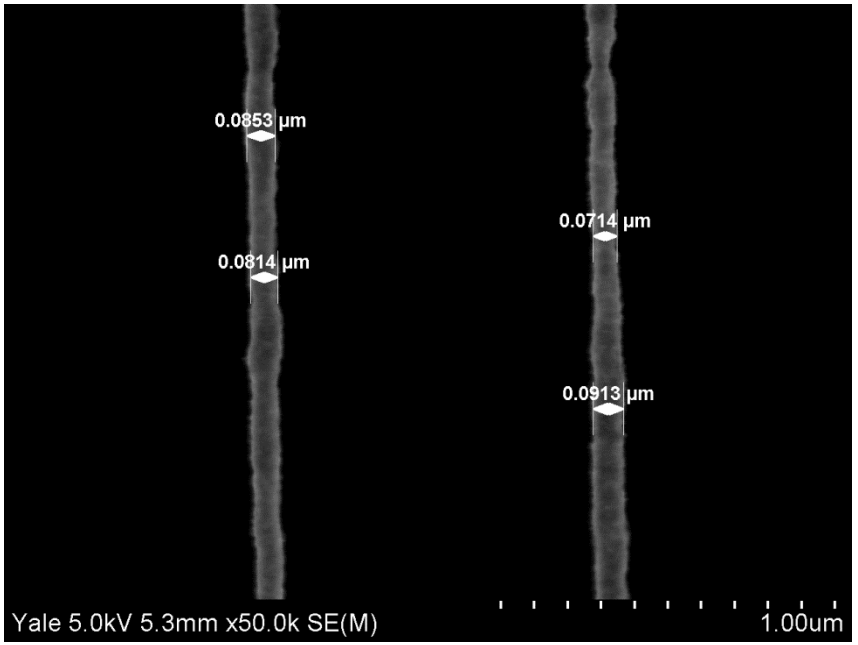

When HSQ goes bad, the first sign is a drop in dose (increased sensitivity).
Also, scum between features becomes more pronounced.

M. Rooks, Yale University

Frozen at 77°K 12 months




Liquid at -27°C for 12 months




Line edge roughness increases as HSQ deteriorates.

M. Rooks, Yale University

HSQ shelf life is ~ 9 months when stored at -27°C

HSQ shelf life at 77°K is very long – many years, at least

Liquid nitrogen storage units are reliable and inexpensive.


Worthington HC35
$1600 from Amazon

10 canisters

Uses < 0.5 liter/day
= 0.16 $/day

Top it off every two weeks.

CT Cryogenics CT 35/80
~ $700

6 canisters

4 ml HDPE bottles
VWR cat. #414004-151

Dispense the resist into 4 ml bottles
then warm them up one at a time.