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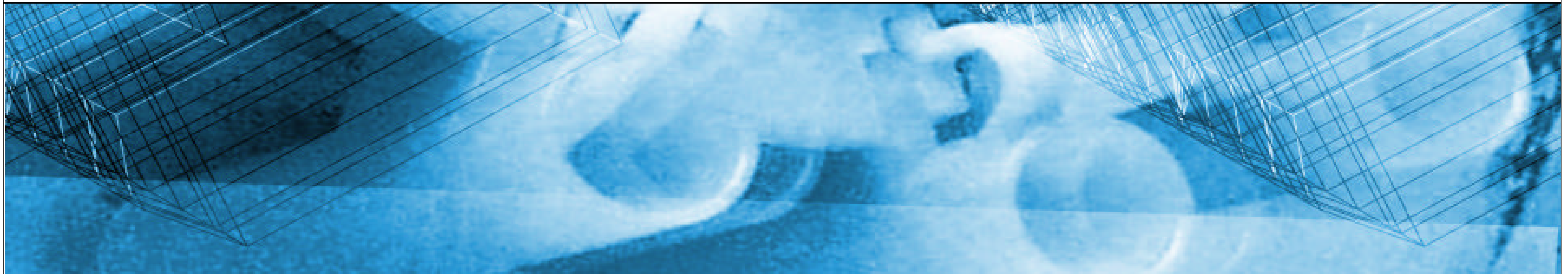

September 15, 2006

AZ514 as a positive photoresist

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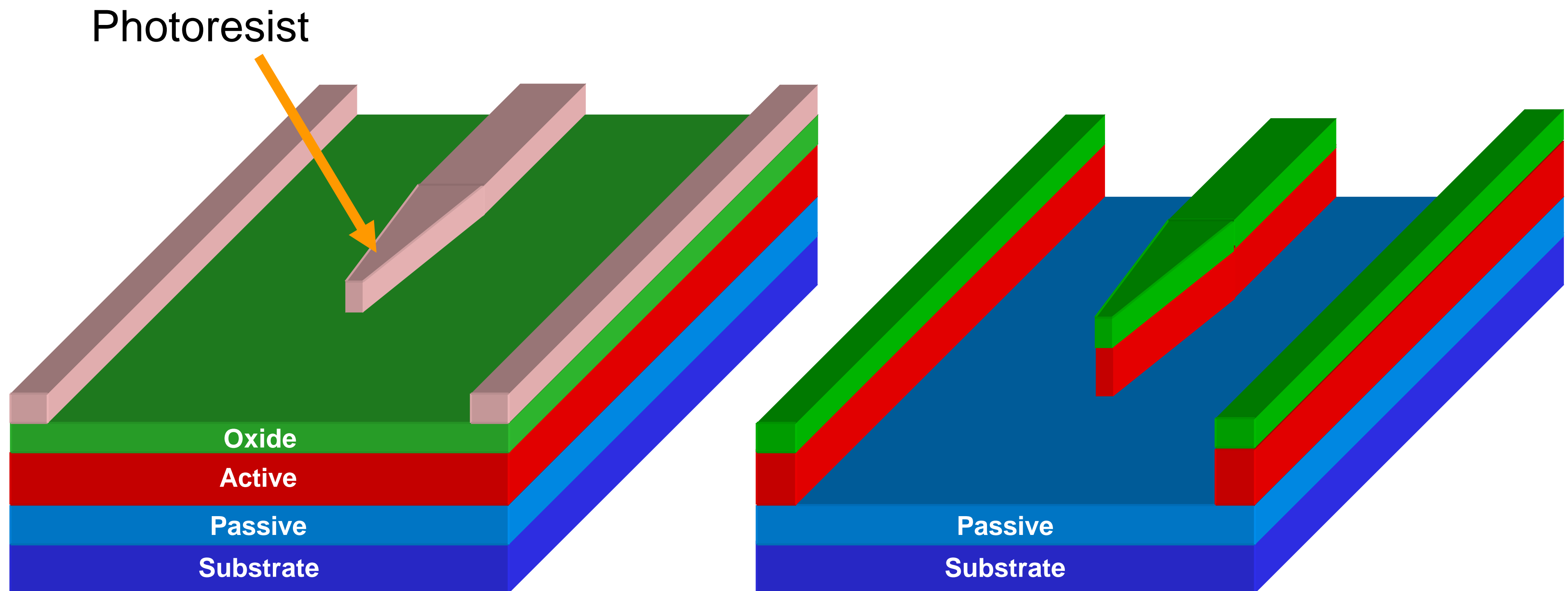
Integrated Photonic Devices and Materials Group

Optical Logic

Processing

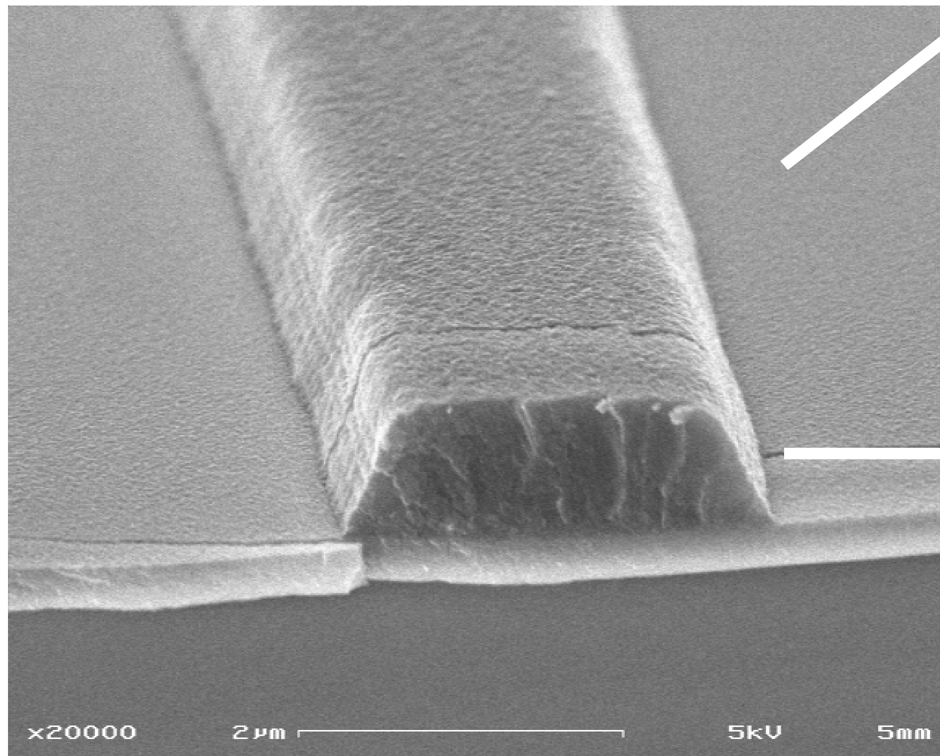
- Pattern photoresist
- Etch oxide, strip resist
- RIE etch active region (CH_4/H_2 RIE or ICP RIE)

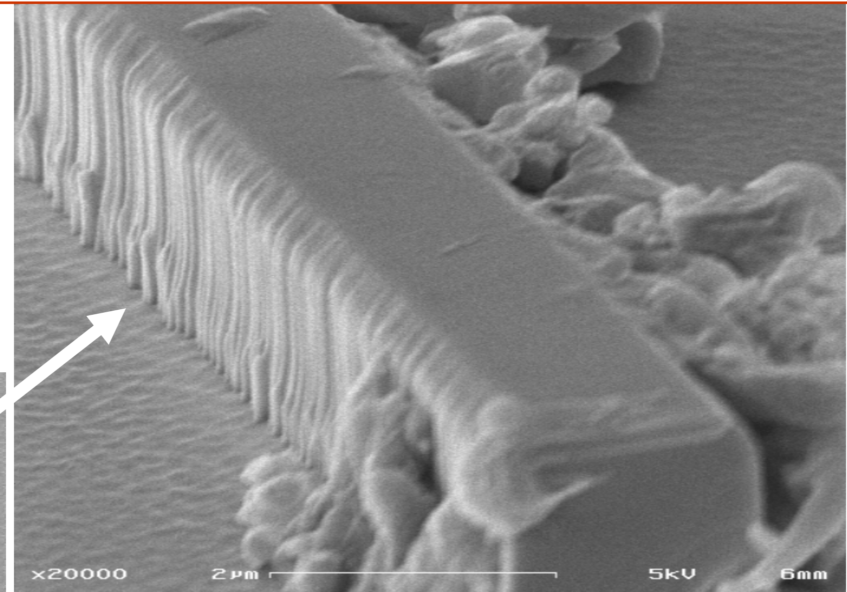


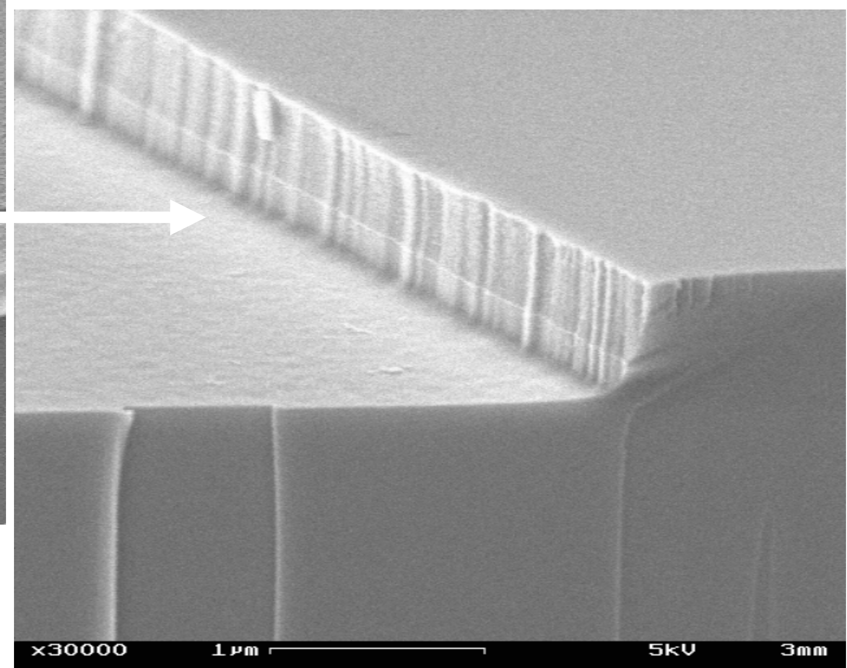
Optical Logic

Problem

- Sidewall roughness – traced back to resist roughness with OCG-825 20 in TRL







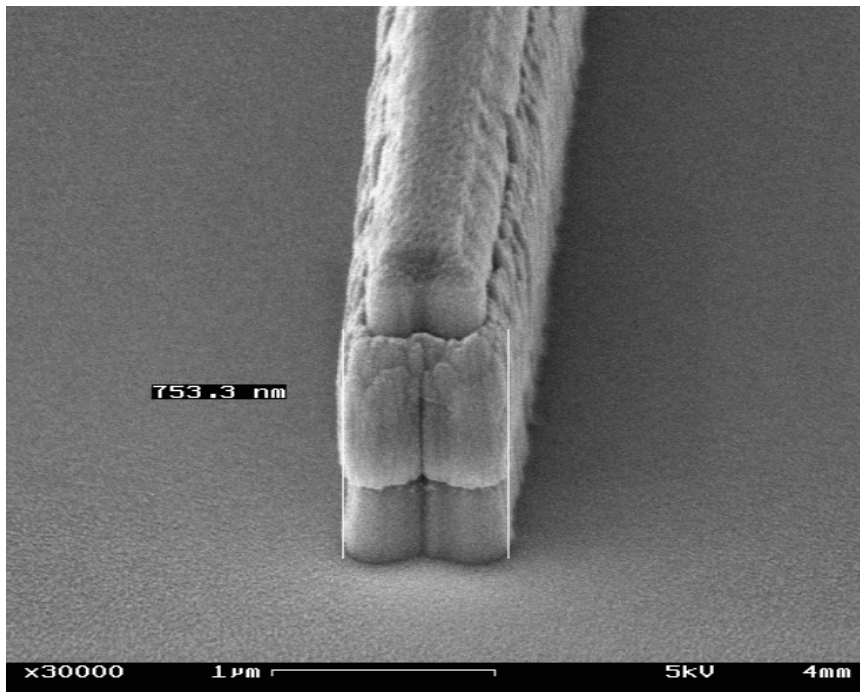
Optical Logic

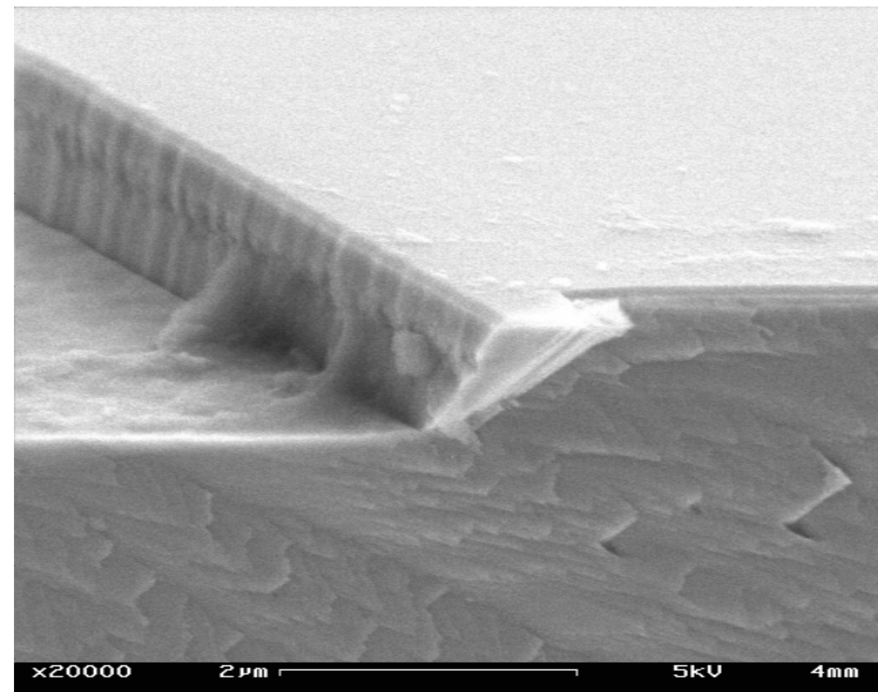
Problem

- Sidewall roughness – traced back to resist roughness OCG-825 20

Solution

- Evaluate different positive resist
  - AZ5214 traditionally used for image reversal
  - Will try to use as positive resist
  - Additional benefit – single resist

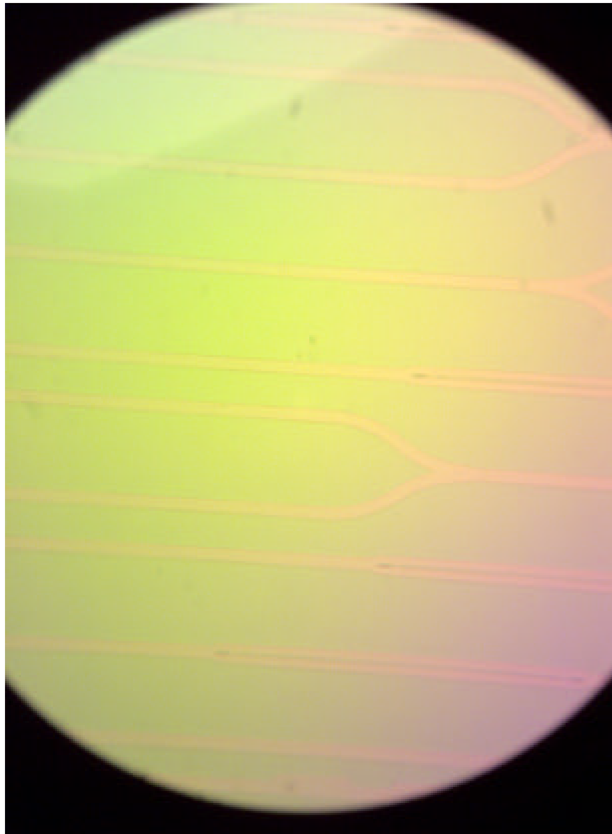




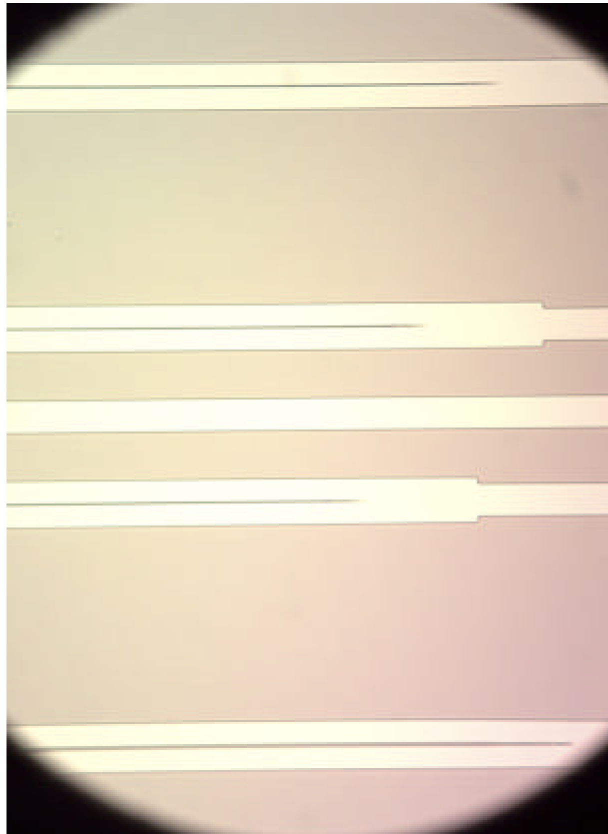
Optical Logic

AZ5214 Resist Evaluation

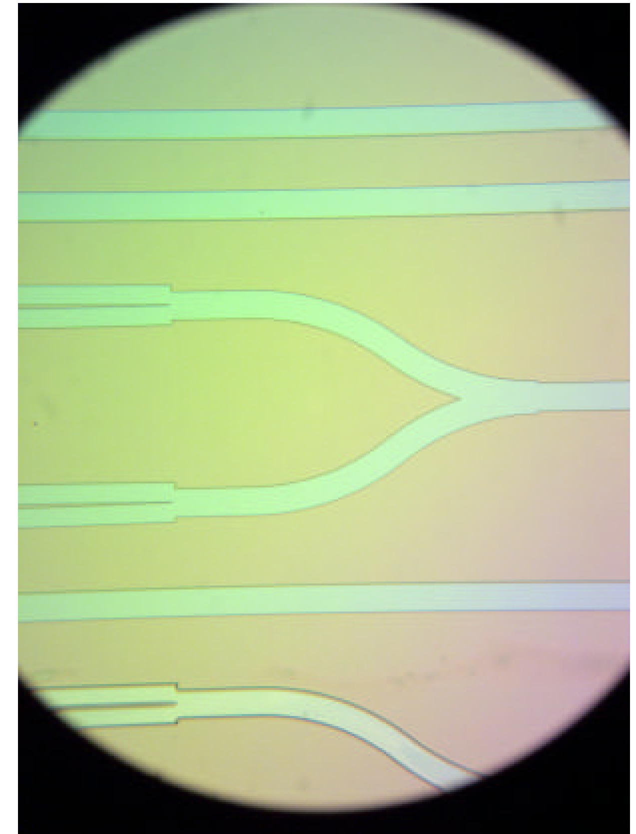
- Determine exposure time
- Determine developer and time



1.5 sec → Underexposed
AZ300 → No Develop



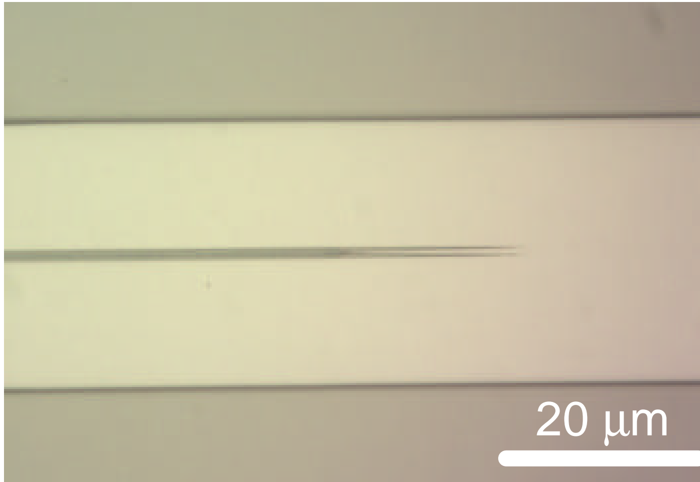
10 sec → Good Exposure
AZ300 → Bad Develop



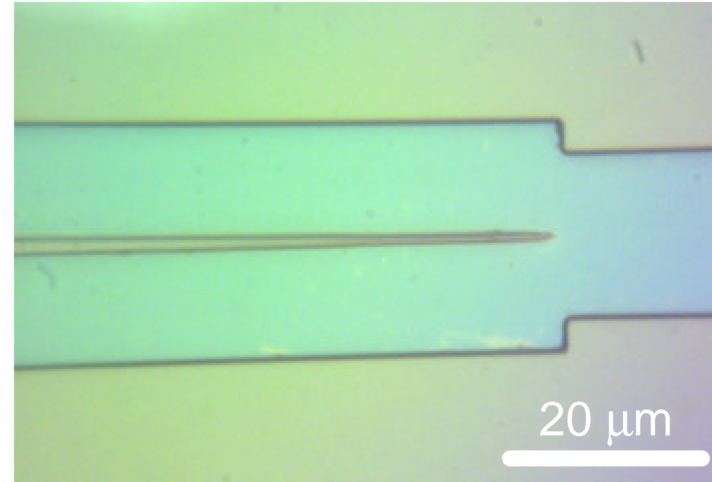
10 sec → Good Exposure
AZ422 → Good Develop

Optical Logic

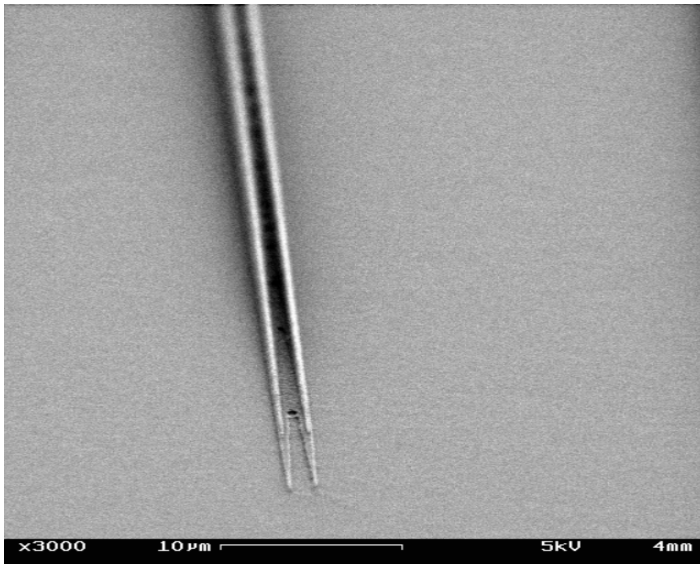
AZ5214 Resist Evaluation

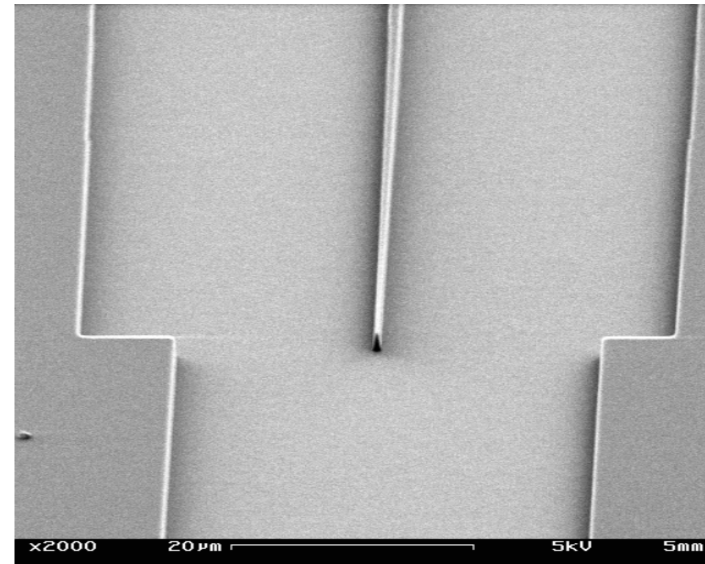


Overdeveloped, taper tips receding



Good develop, well-defined tips

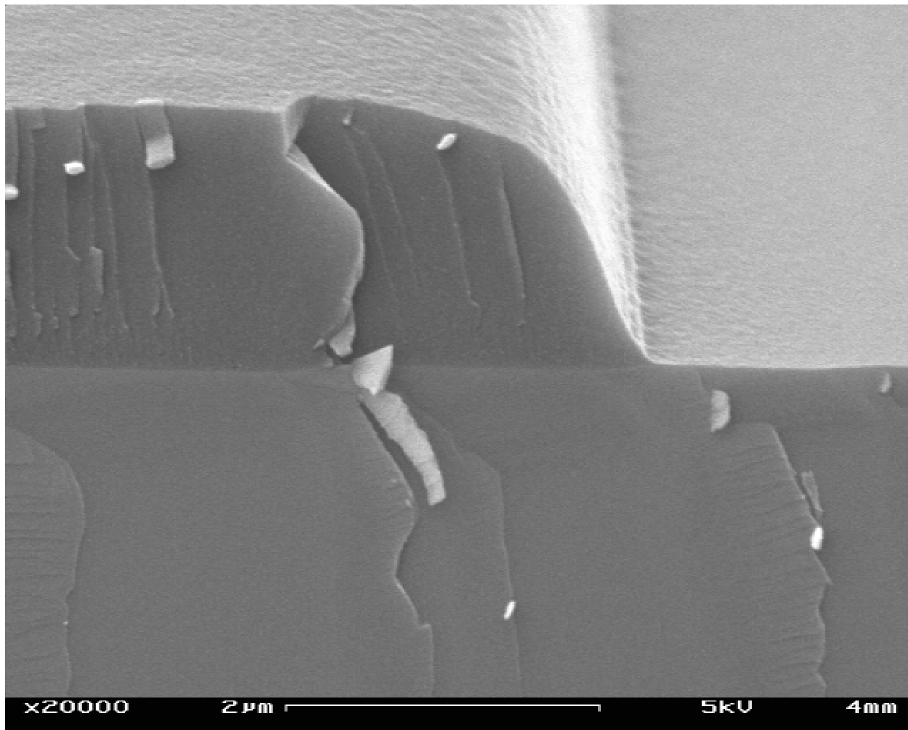




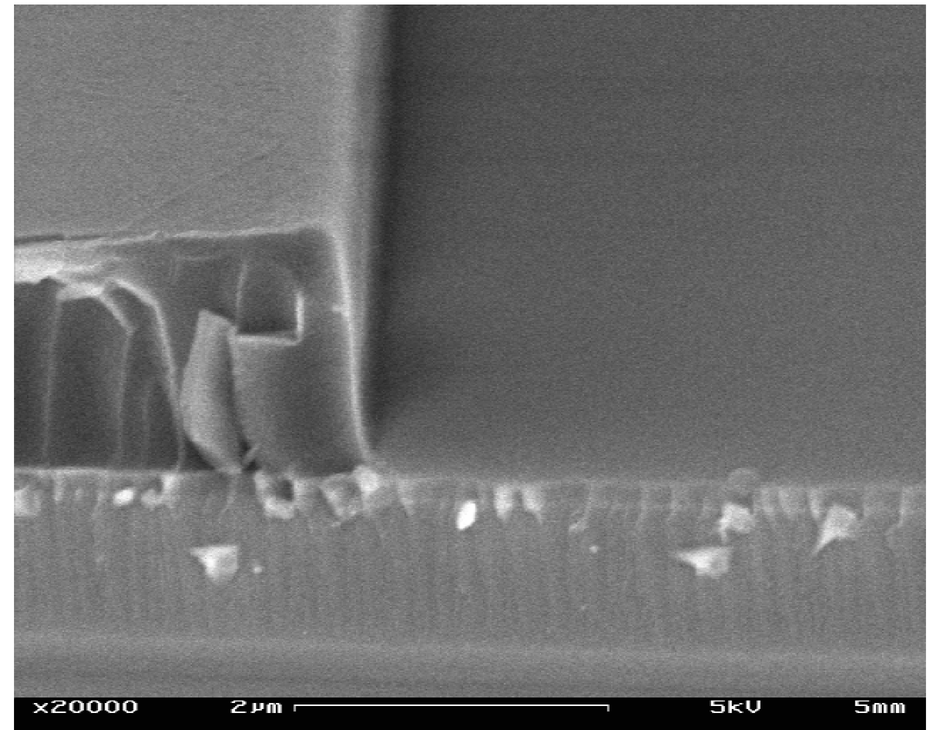
Optical Logic

AZ5214 Resist Evaluation

- Postbake reflow improves sidewalls, but want to improve sidewall profile as well



Postbake 95°C 30 min
Sidewall slope ~60°

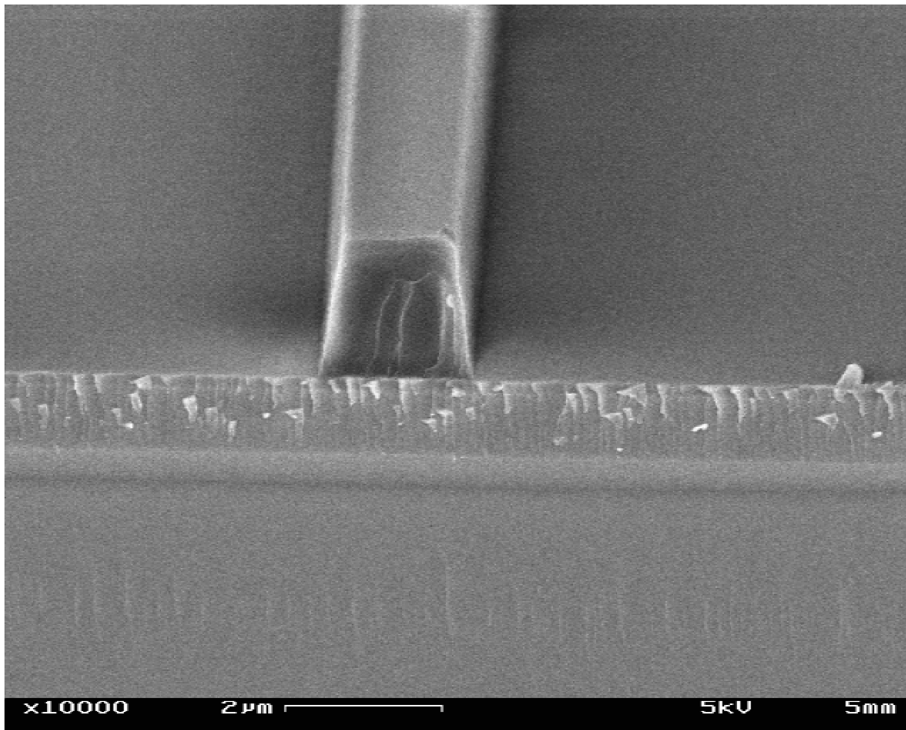


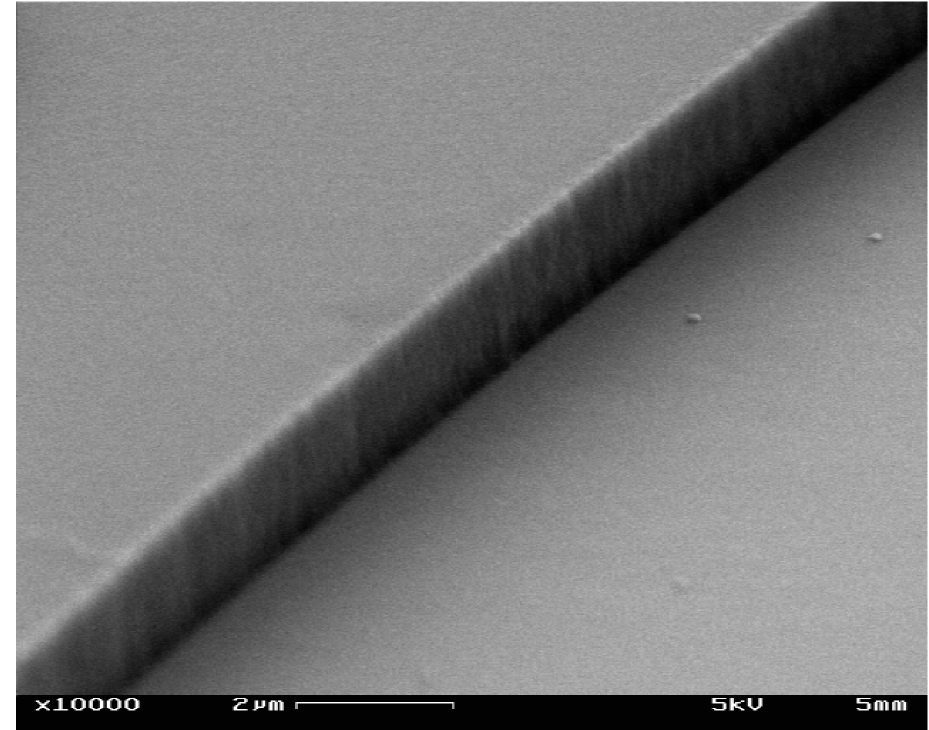
No postbake
Vacuum cure: 15 min ~10^{-5} torr (turbo)
Sidewall slope ~80-85°

Optical Logic

AZ5214 Resist Evaluation

- Sidewall roughness better, but still remains
  - → $He/0_2$ Descum 10 sec

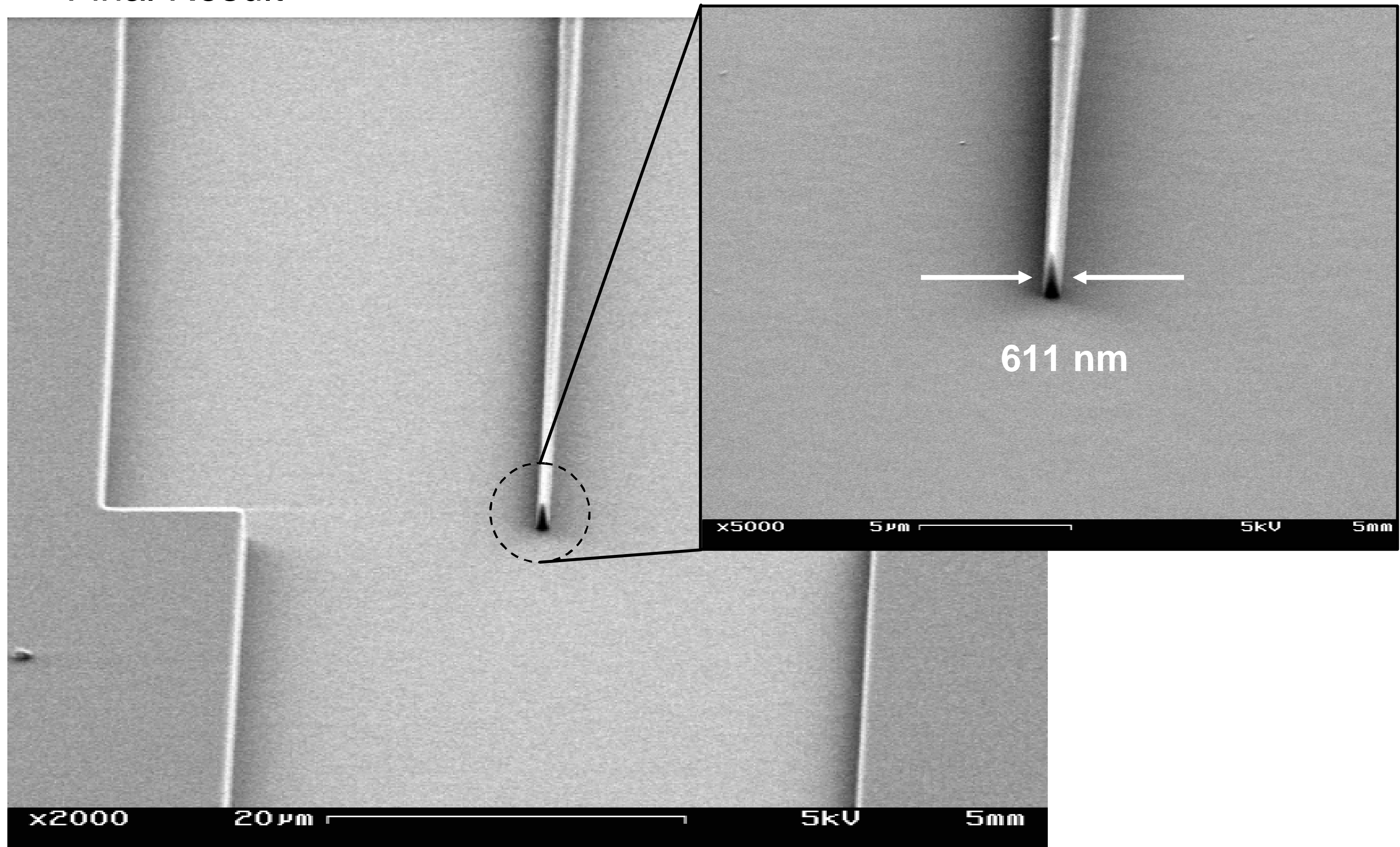




Optical Logic

AZ5214 Resist Evaluation

- Final Result



Optical Logic

AZ5214 as a positive resist with smooth, vertical sidwalls

- HMDS: Recipe 5 in TRL
- Coater
  - Dispense: 500 rpm, 3 sec
  - Spread: 750 rpm, 6 sec
  - Spin: 4000 rpm, 30 sec ~1.4-1.5 μm
- Prebake: 95° **35 min**
- Expose EV1: 10 sec, vacuum + hard contact (v+h)
- Develop: AZ 422 1:45-2:00 min
- Vacuum cure: 15 min 10^{-4}-10^{-5} torr
- DESCUM: He/O_2 plasma, 10 sec, 7 mtorr, NSL Plasmatherm