

Probing the Potential of Nanostructured Polymer Brushes

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Chemistry, SUNY ESF*

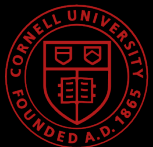
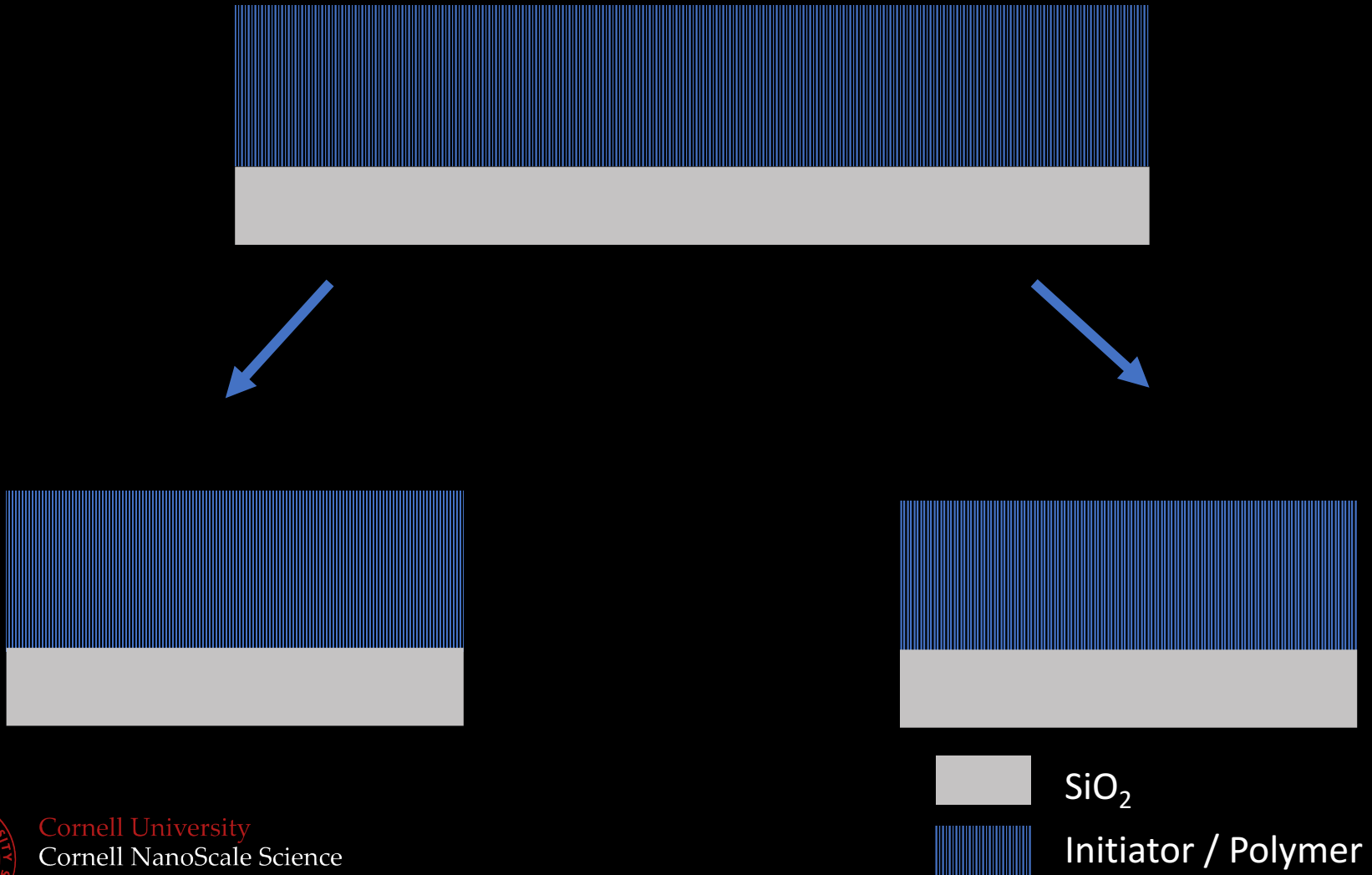
*Christopher Ober and Wei-Liang Chen, Materials
Science and Engineering, Cornell University*



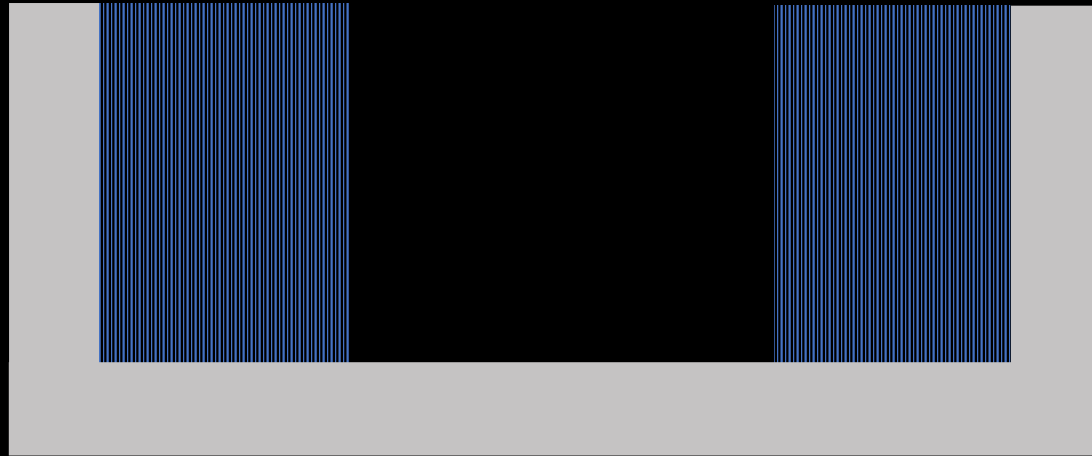
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University



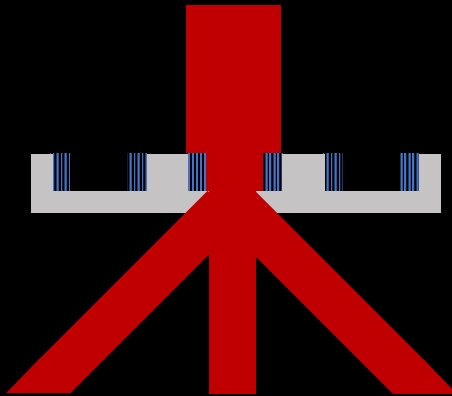
Observing Polymer Brushes



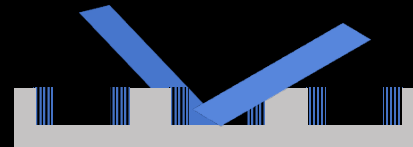
Observing Polymer Brushes



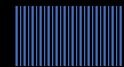
Laser Diffraction



Neutron Beam Scattering



SiO₂

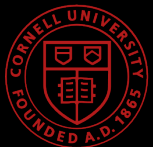
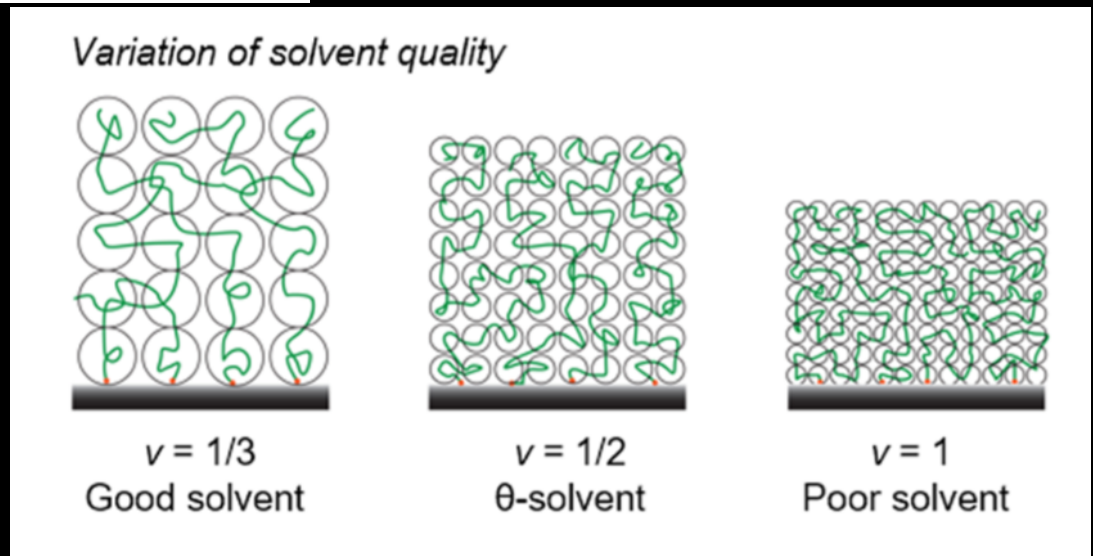
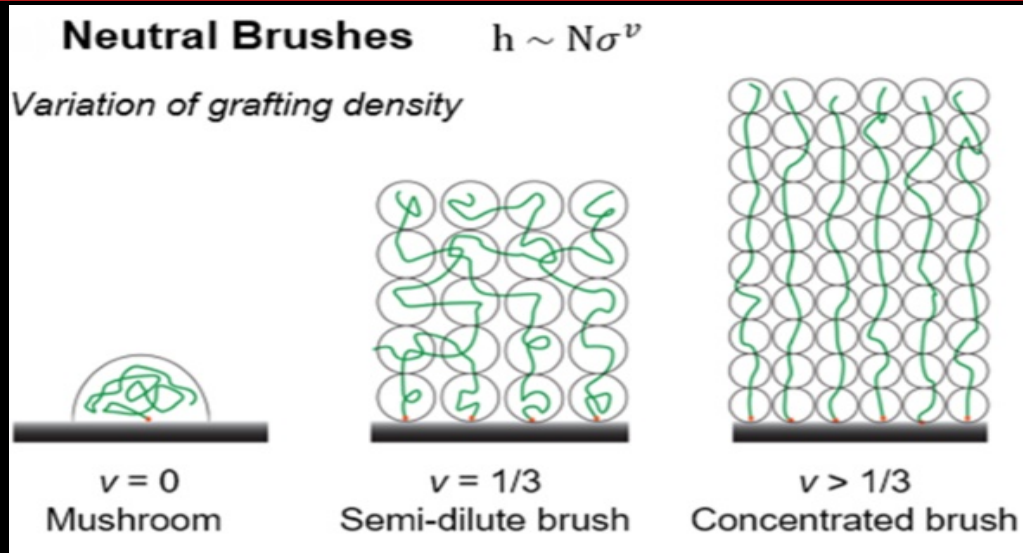


Initiator / Polymer

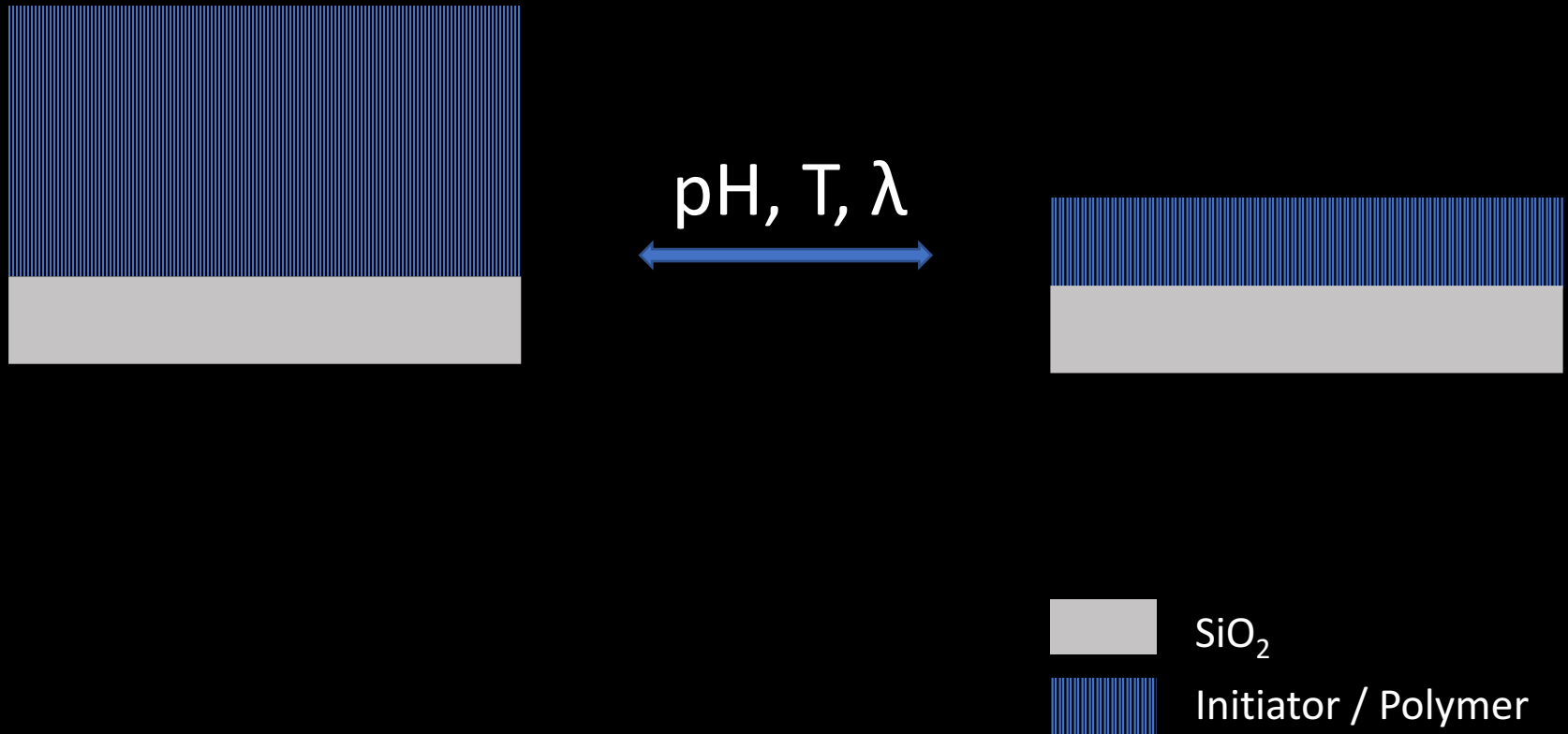


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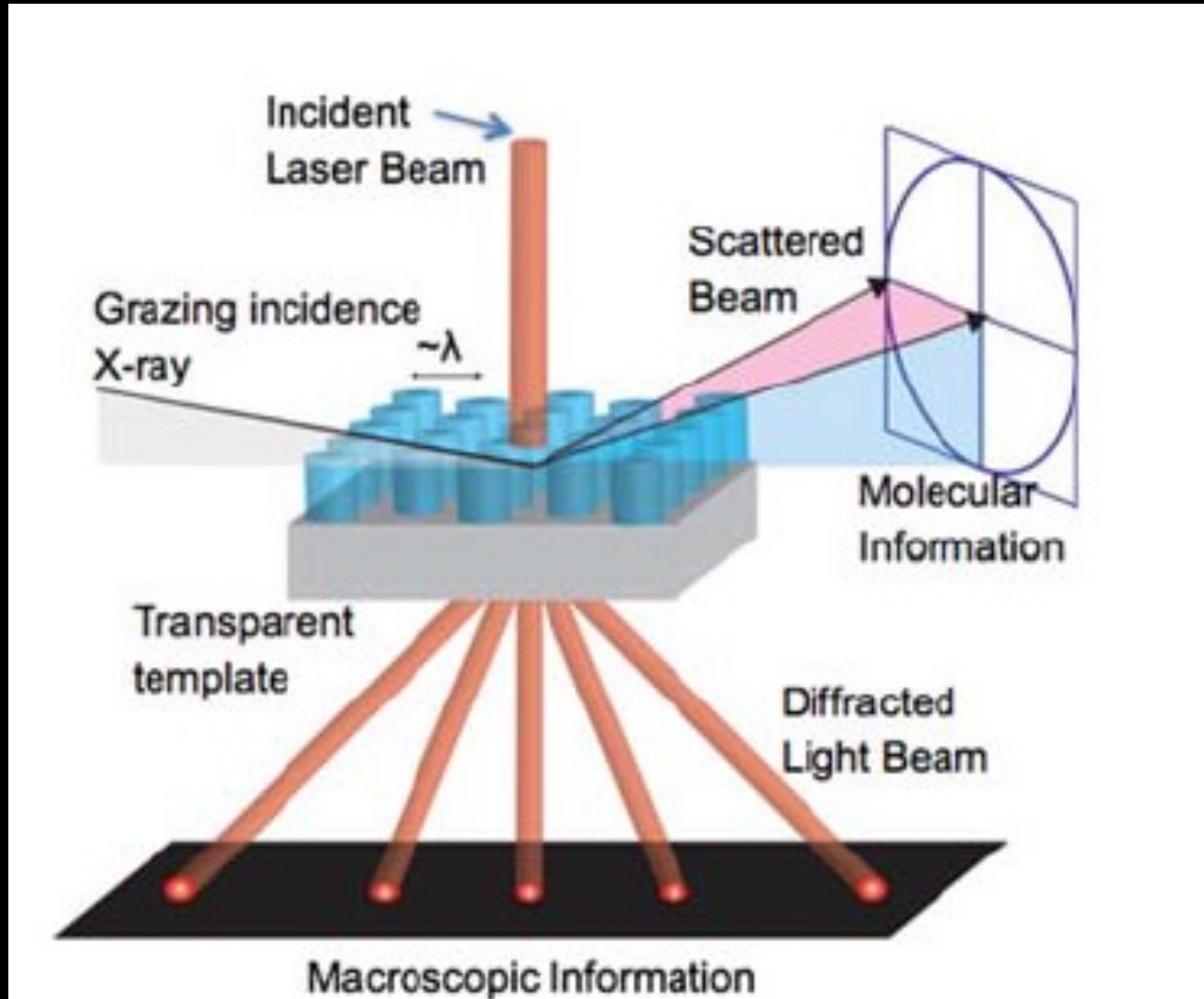
What are Polymer Brushes?



Polymer Brush Reactivity



Diffraction Grating



Diffraction Grating



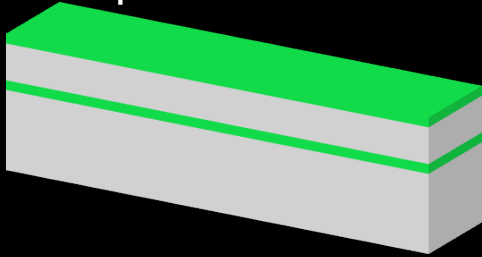
Gap: 300 ~ 400 nm
Depth: 600 ~ 250 nm
line: space = 1:1
Material: Quartz


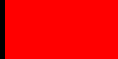




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Sidewall Process

1. Deposit materials on wafer

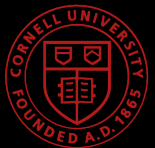
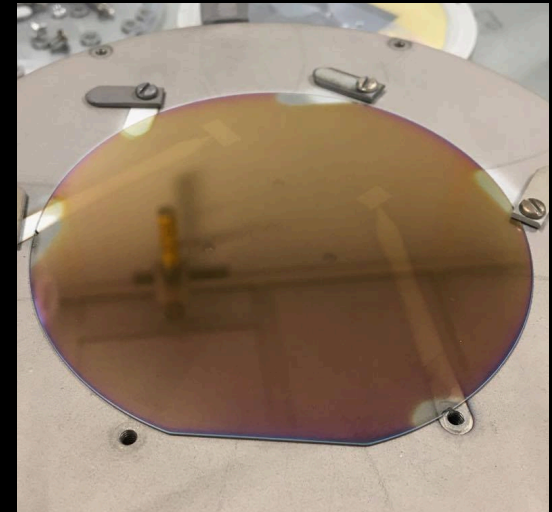
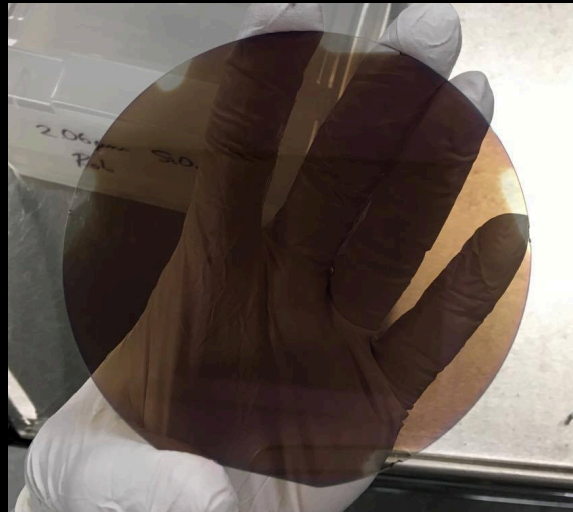
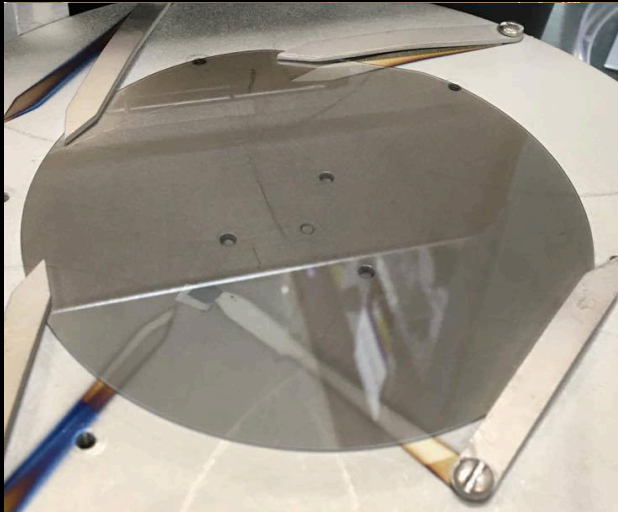
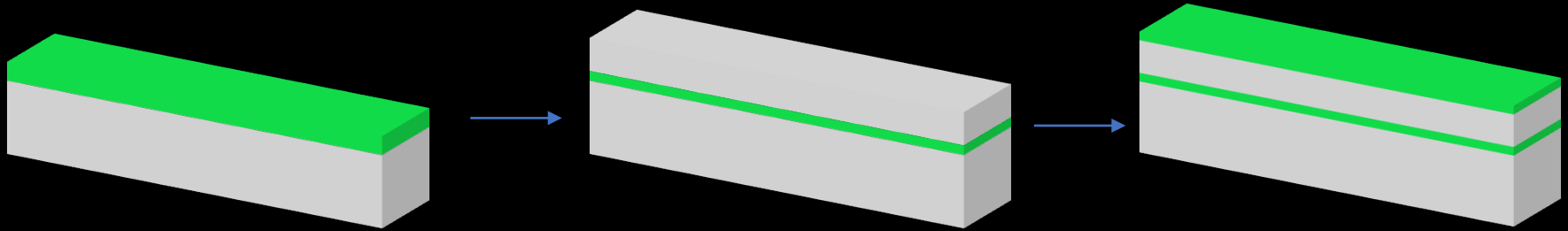


	Cr		PR
	SiO ₂		
	Initiator / Polymer		



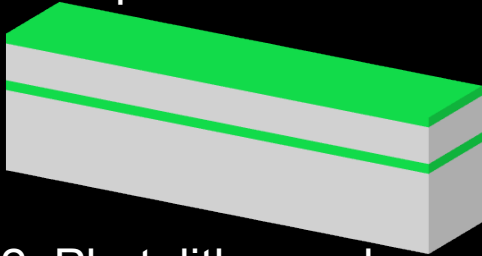
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Building the Structure

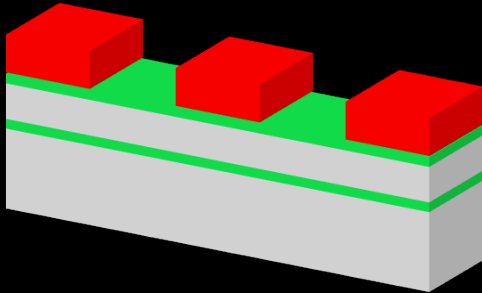



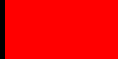


Sidewall Process

1. Deposit materials on wafer



2. Photolithography patterns



	Cr		PR
	SiO ₂		
	Initiator / Polymer		



Photolithography Patterns



Labels

250

300

350

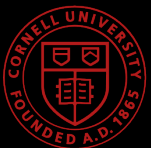
400

450

500

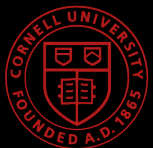
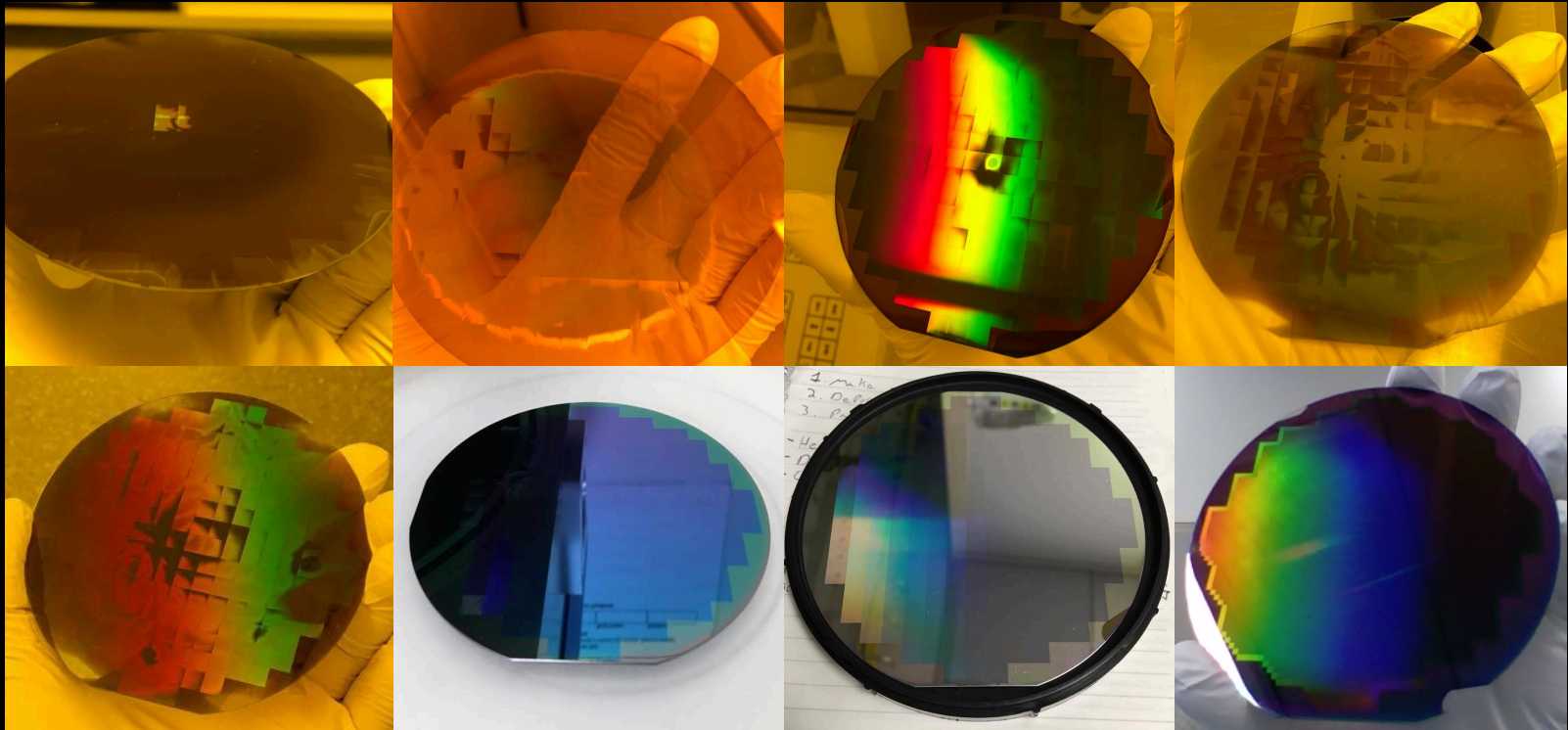
550

600



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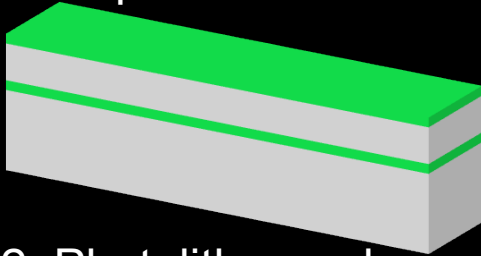
Wafer Development



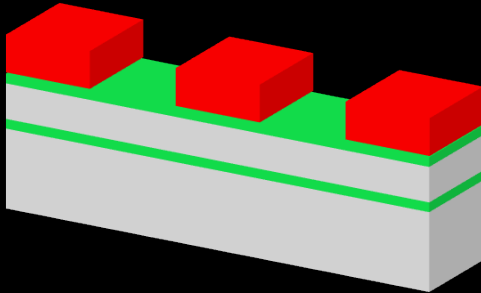
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Sidewall Process

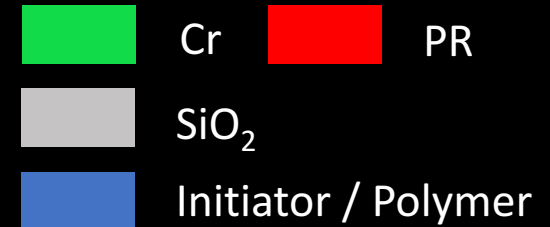
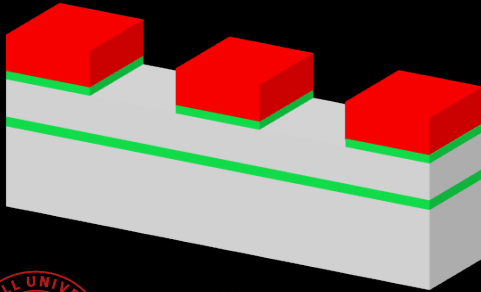
1. Deposit materials on wafer



2. Photolithography patterns

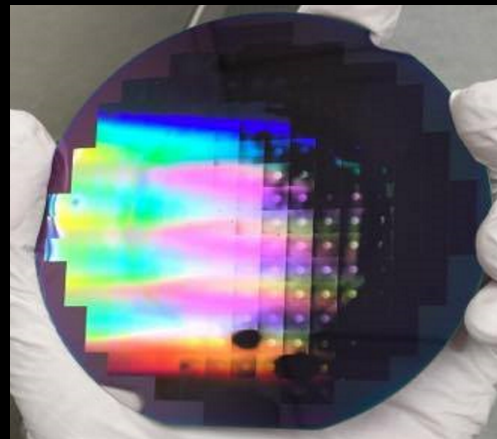
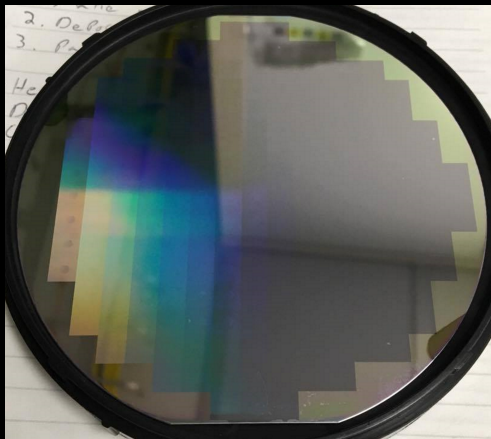
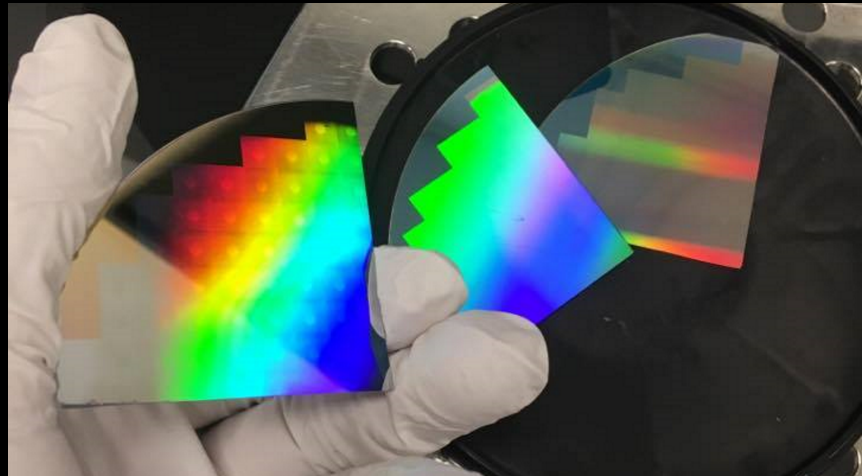
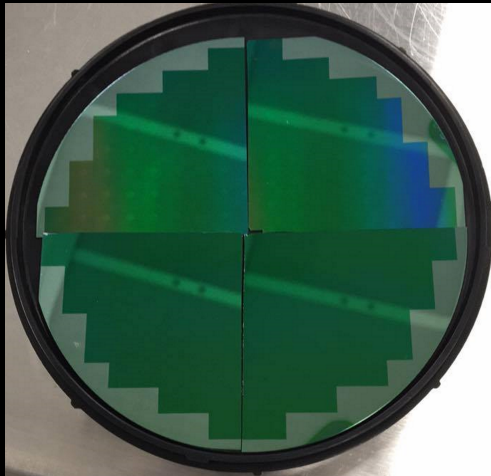


3. RIE pattern transfer to Cr



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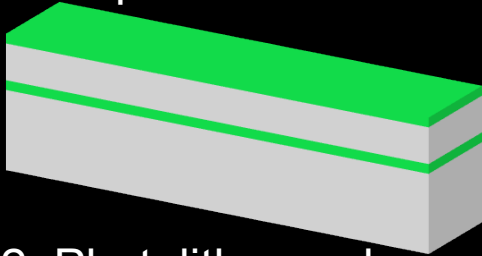
Chrome Etch



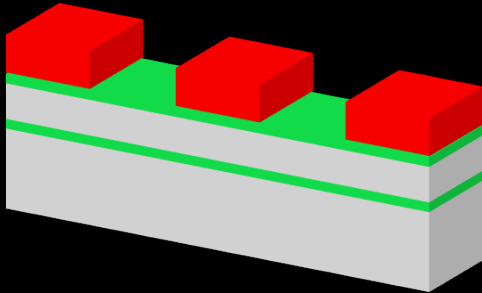
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Sidewall Process

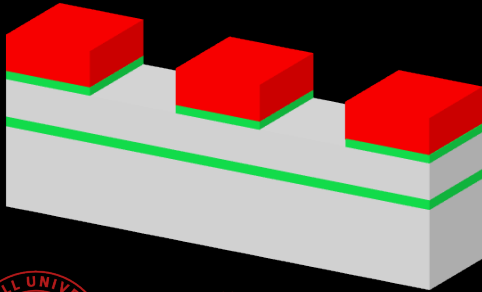
1. Deposit materials on wafer



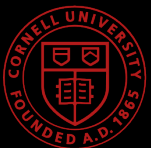
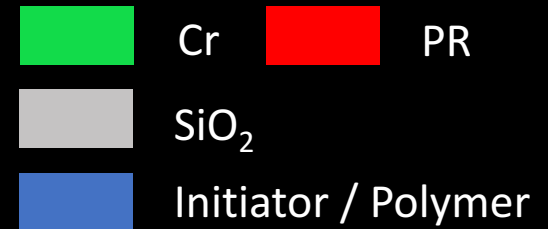
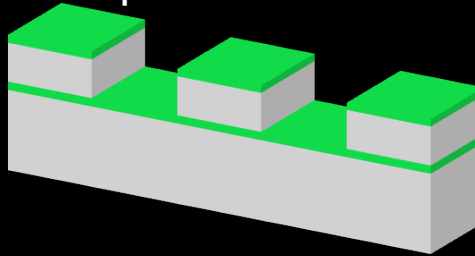
2. Photolithography patterns



3. RIE pattern transfer to Cr

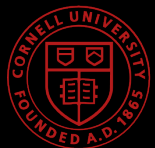
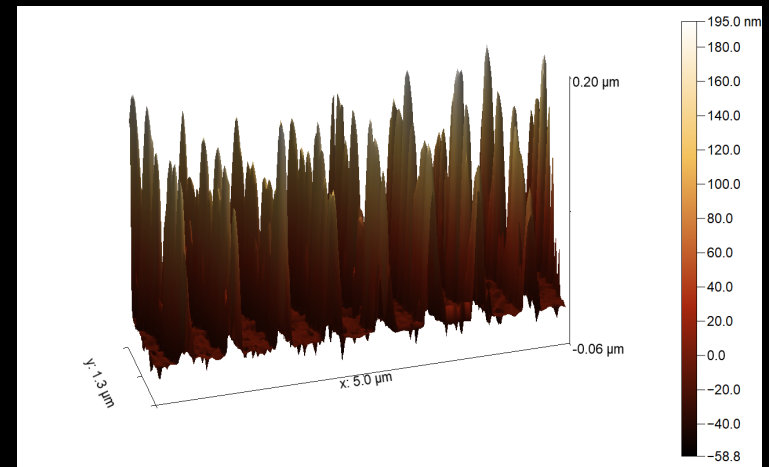
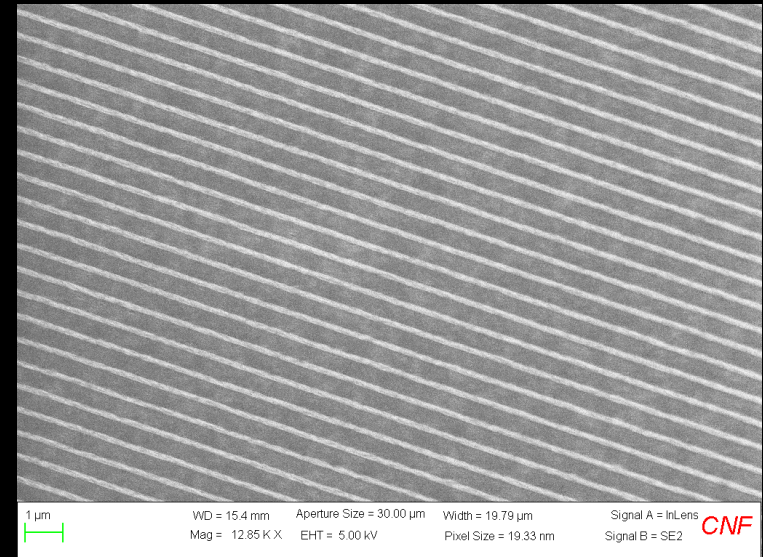
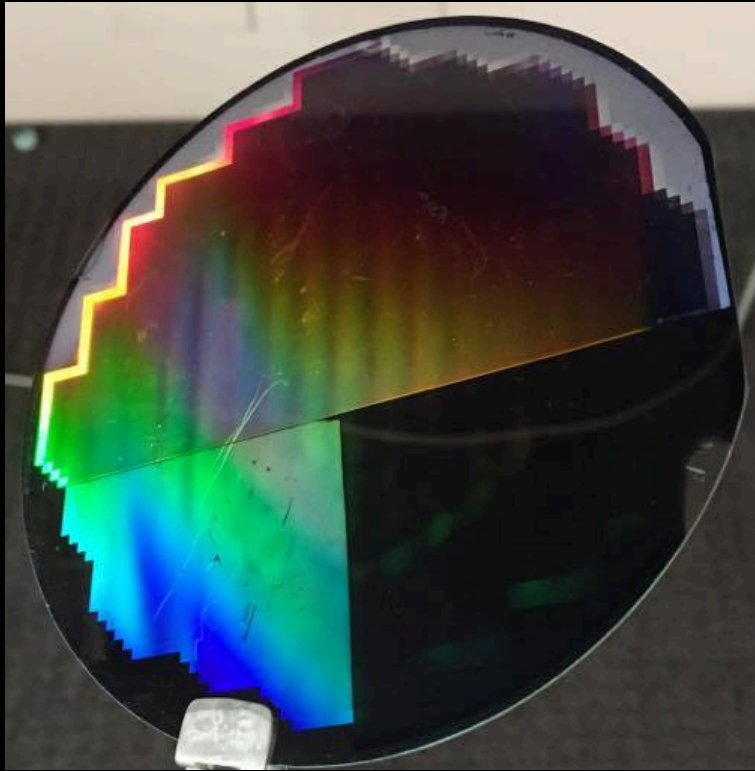


4. RIE pattern transfer to SiO₂



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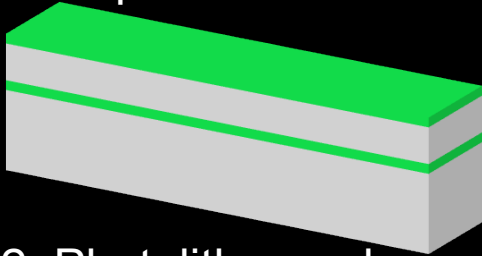
Silicon Dioxide Etch



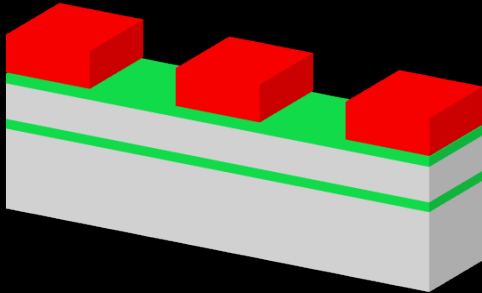
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Chrome Etch

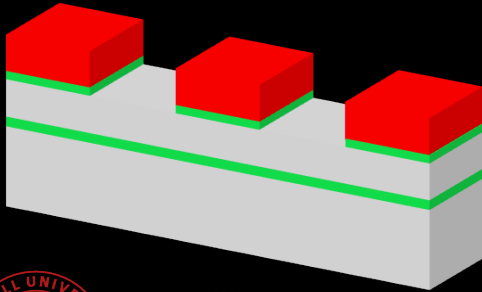
1. Deposit materials on wafer



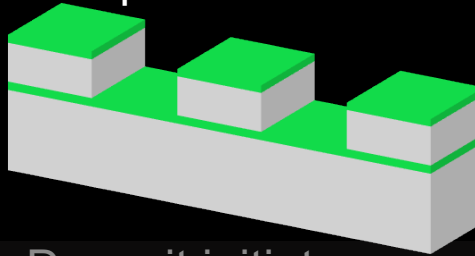
2. Photolithography patterns



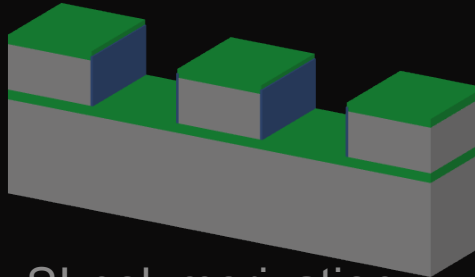
3. RIE pattern transfer to Cr



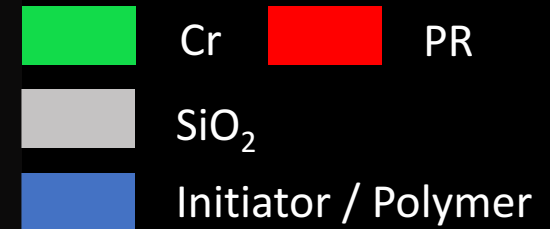
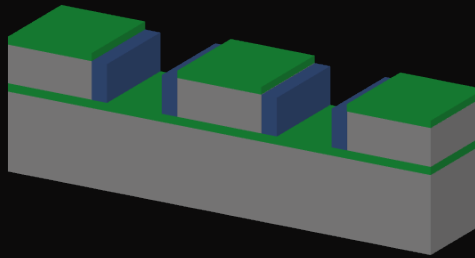
4. RIE pattern transfer to SiO2



5. Deposit initiator

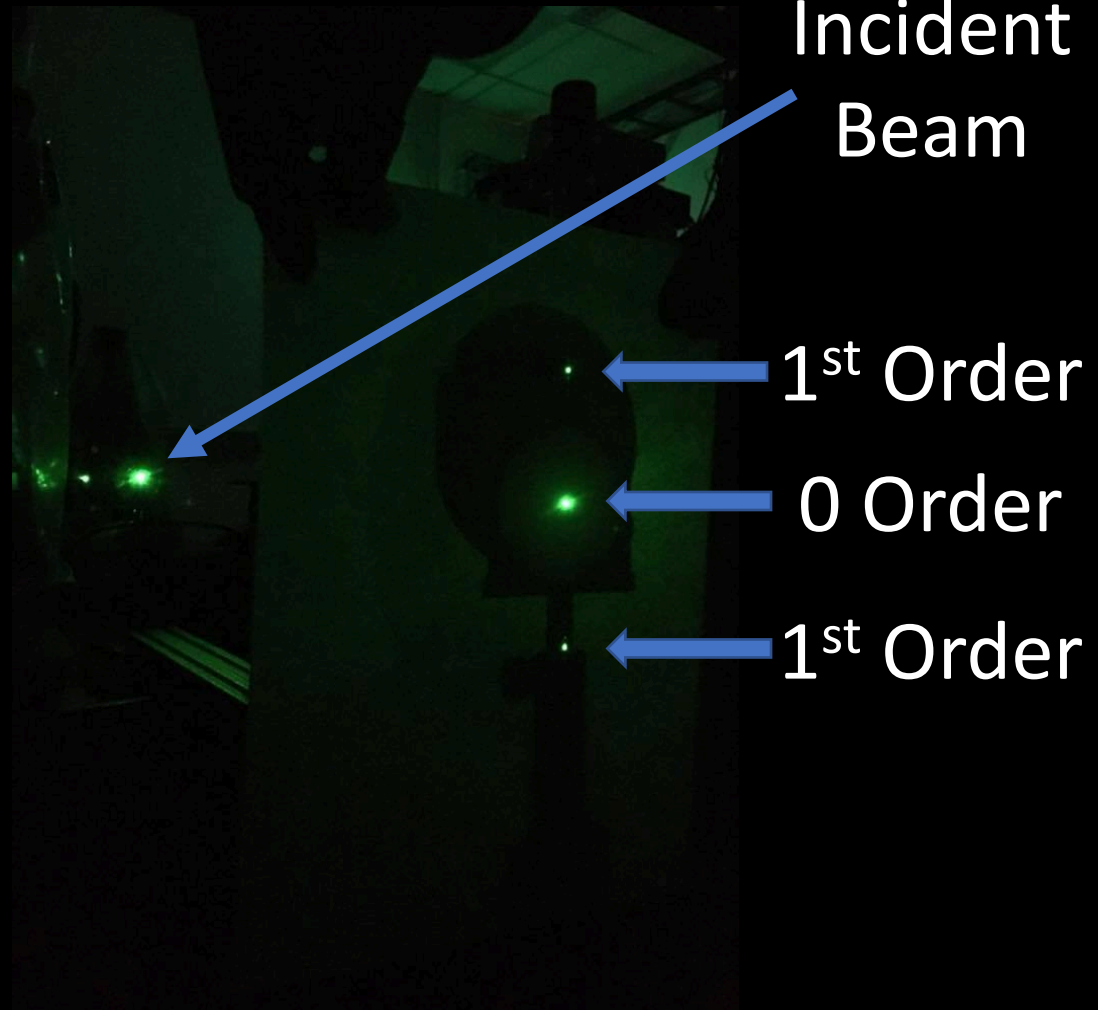
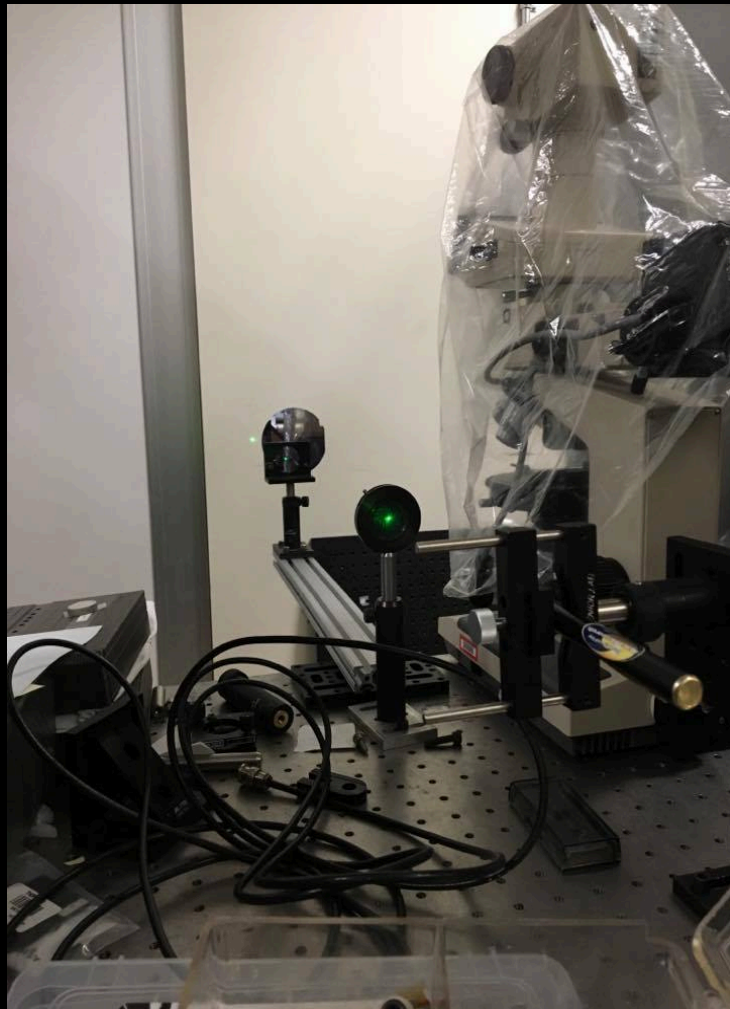


6. SI-polymerization



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Light Diffraction

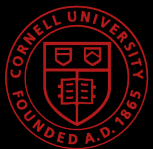


Incident
Beam

1st Order

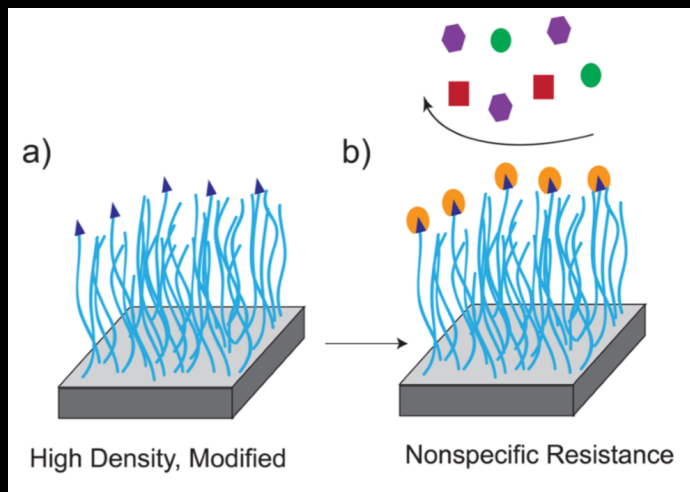
0 Order

1st Order

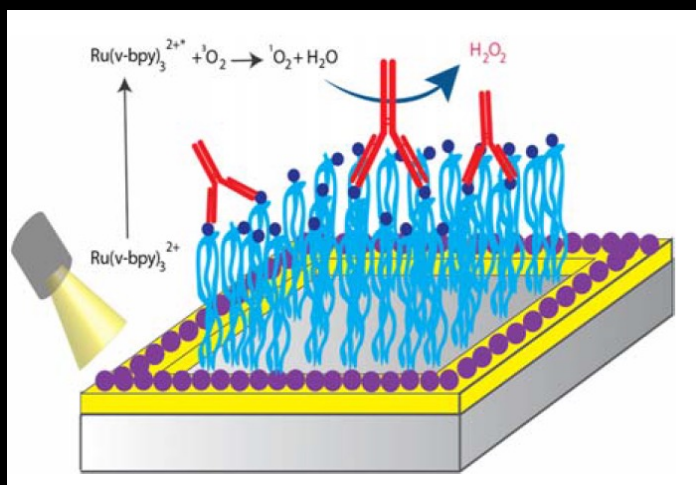


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Why are polymer brushes important?



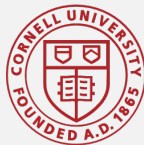
- Antifouling
- Resistance to nonspecific binding
- Biosensors
- Cell adhesive surfaces



Acknowledgements

- National Science Foundation
- National Nanotechnology Coordinated Infrastructure
National Science Foundation under Grant No. ECCS-1542081
- Cornell NanoScale Science & Technology Facility

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- Wei-Liang Chen
- CNF REU Coordinators
- CNF Staff



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