NANORESIST

Engineering the Refractive Index for Photonic Structures

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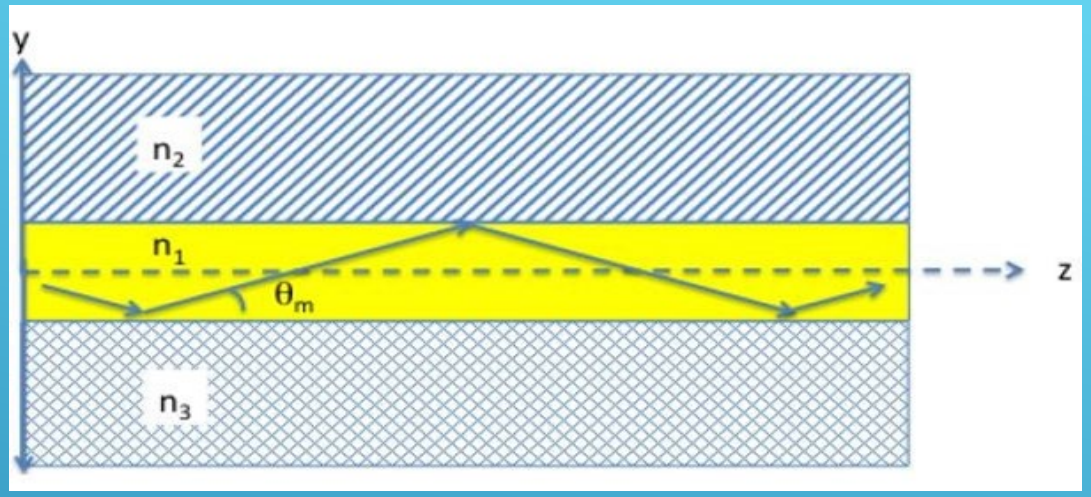
Why is the Index Important?

The refractive index measures how light travels through an object

$$n = \frac{c}{v},$$



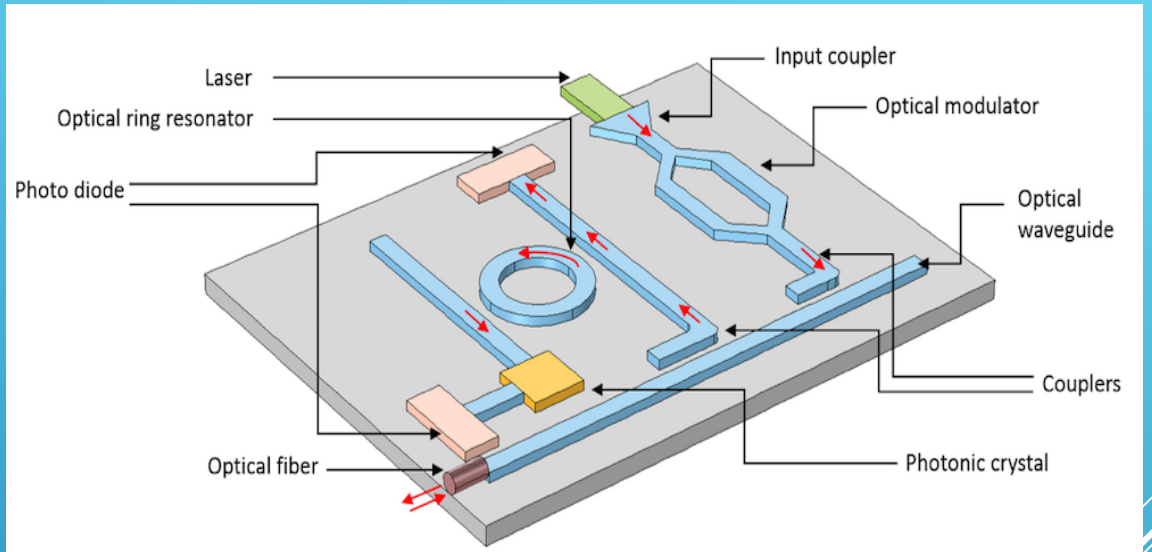
Illustrated demonstration of the refractive index within a waveguide

the index of the water refracts the image of the straw

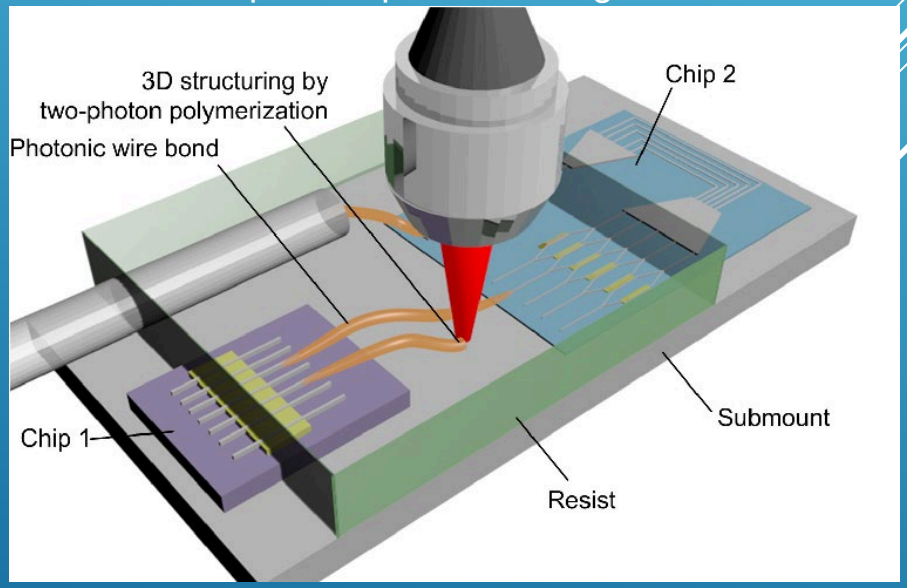
Understanding the index is fundamental to the research and development of photonics

Photonic Integrated Circuits/ Photonic Wire Bonding

- Photonic devices are instruments that transfer information using light in a manner similar to electronics
- Photonic integrated circuits (PIC) are devices that combine multiple components
- Optical connections link individual components together
- Nanoscribe 3D lithography for fabricating Photonic Wire Bonding (PWB)

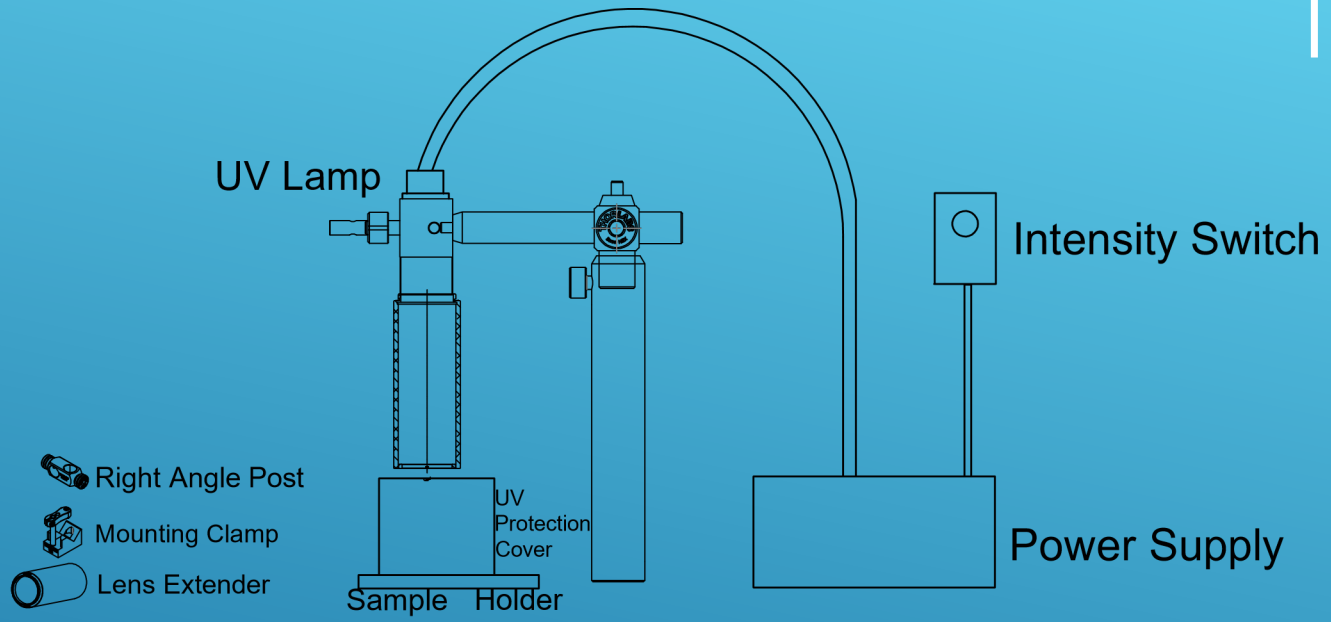


An example of a photonic integrated circuit

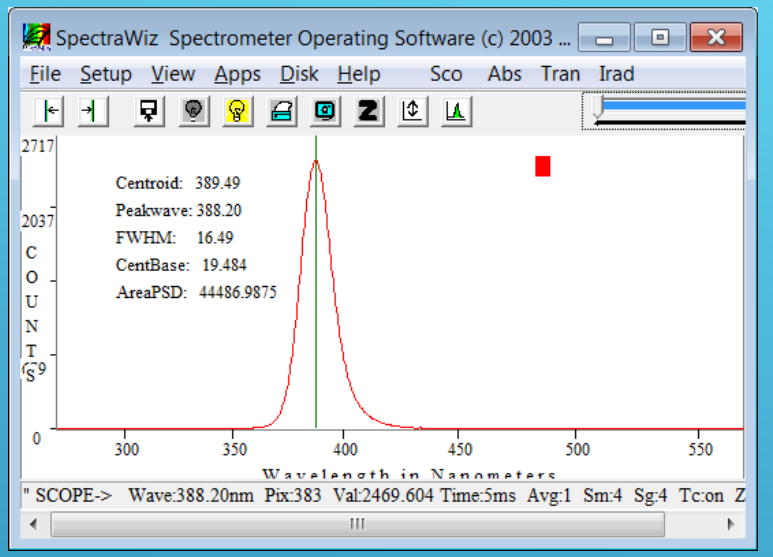


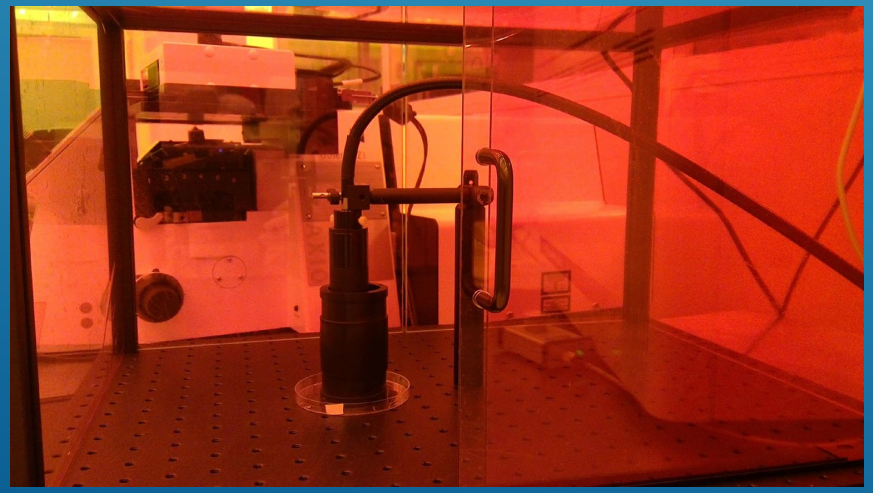
A photonic wire bonding two structures together

The UV Exposure Setup



Auto CAD design of UV exposure device



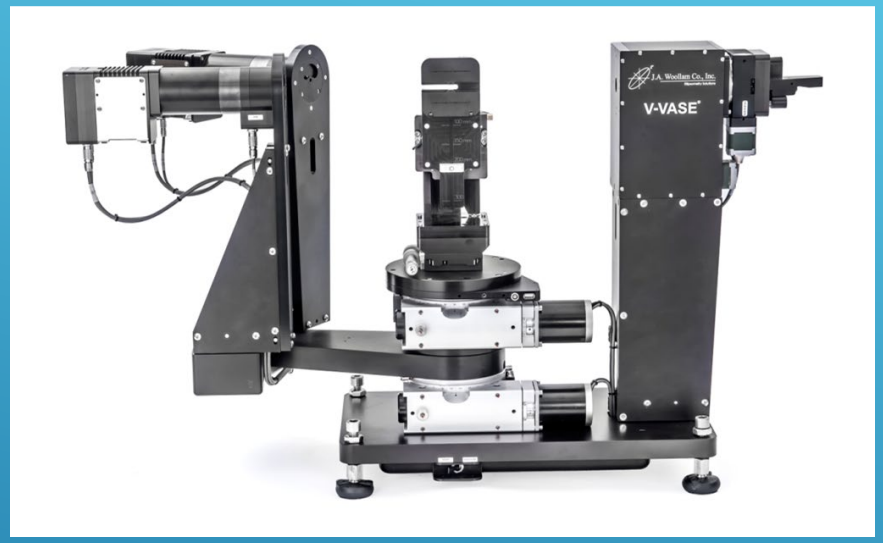


UV exposure device within enclosure

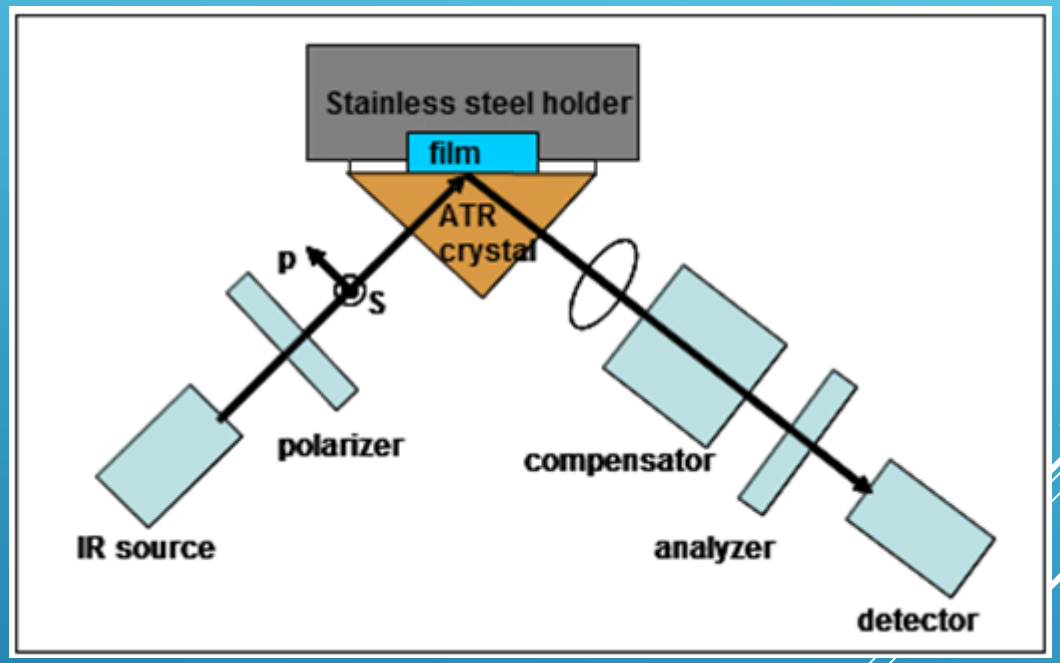
Dosage = intensity of UV light x time

Device positioned with the Nanoscribe

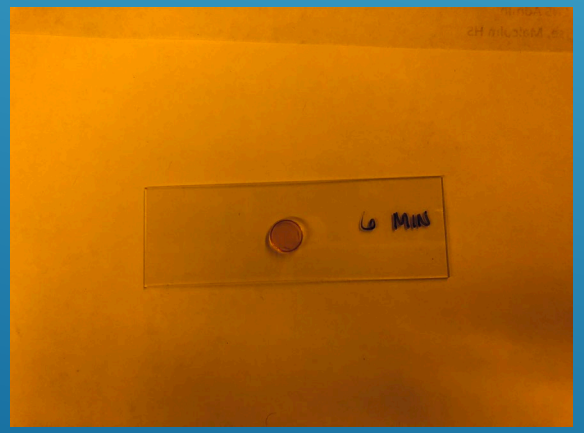
The measurement device



J.A. Woollam VASE spectroscopic ellipsometer measures dielectric properties of thin films



The Block Approach



Bond PDMS to glass slide

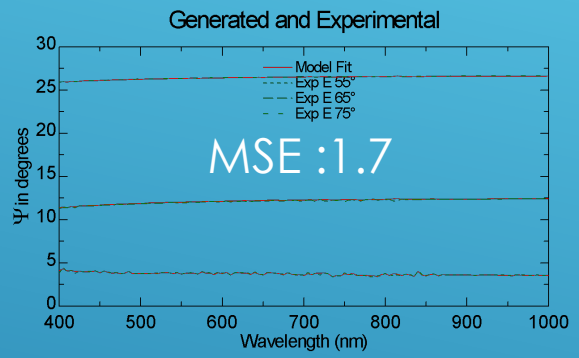
Carve cells into PDMS

Pour IP-DIP in PDMS cells

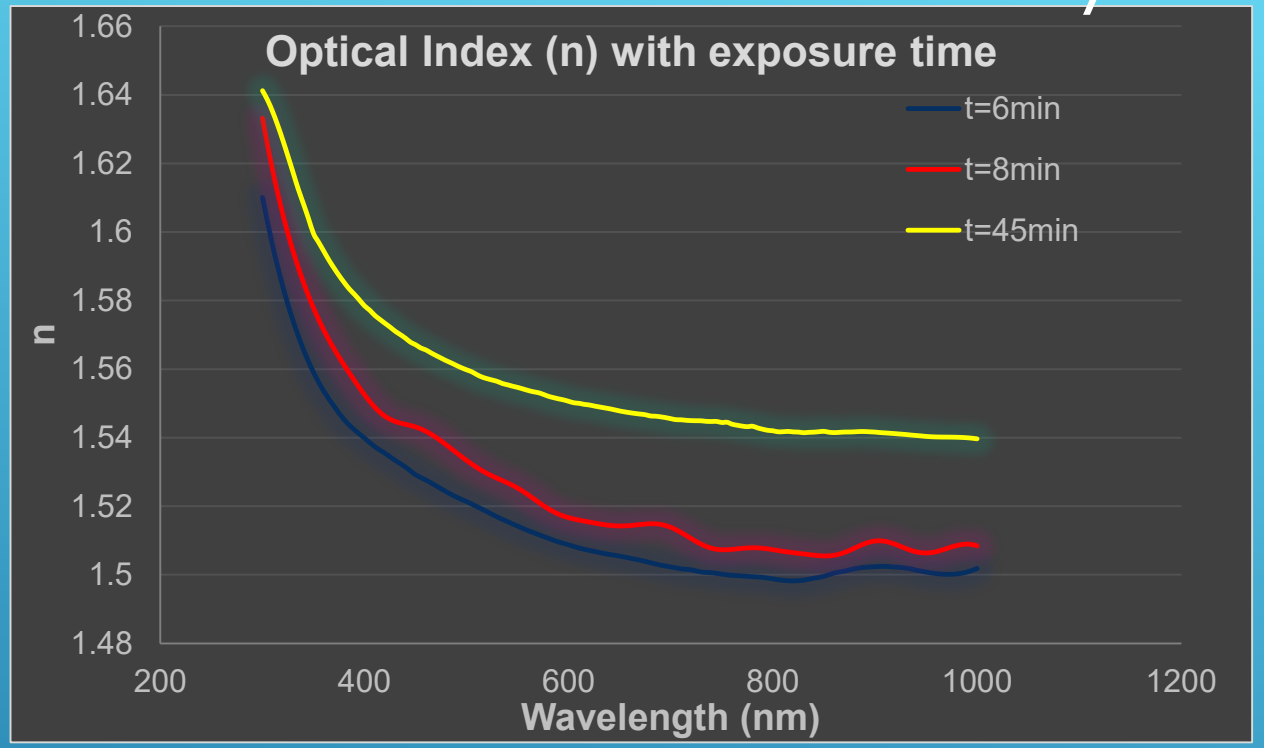
Expose sample (dosage = intensity x time exposed)

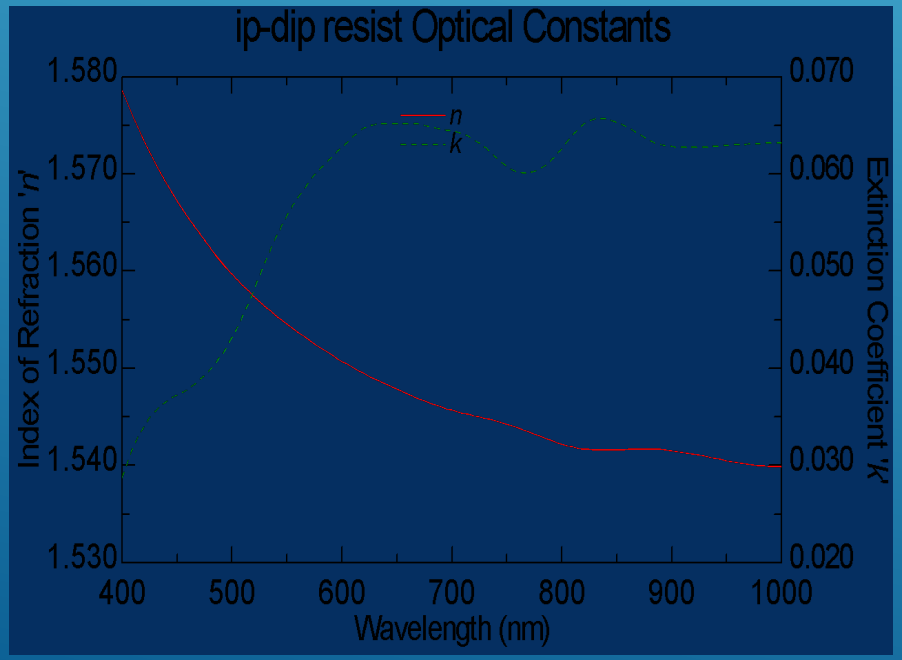
Run scan of sample on VASE

Preliminary Results

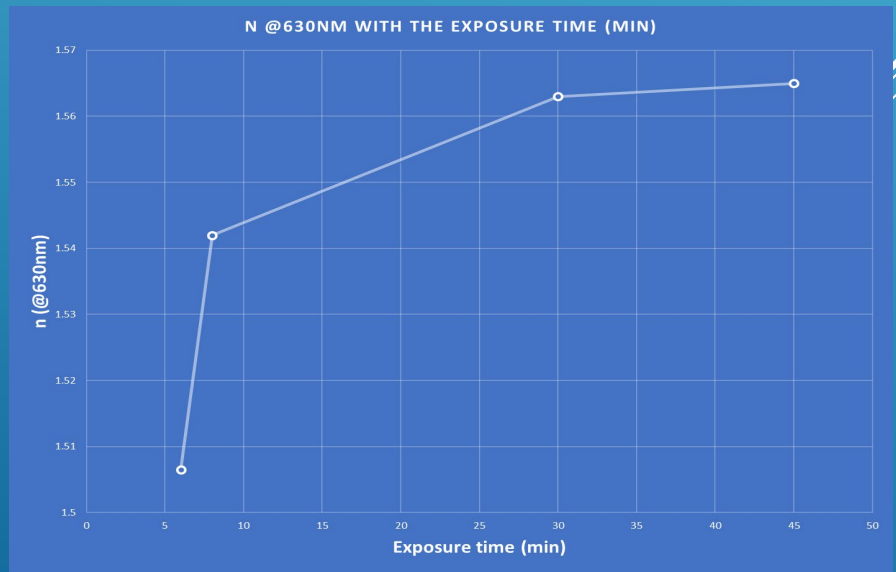


Ellipsometer data (ψ, Δ) and fitting





n, k with wavelength (nm)
(exposure time = 45 min)



Conclusion

- As the dosage in increase, the index of the resist increases as well.
- The index has an average range of 1.50 – 1.57 (@630nm)

The next step?

Future work aims to create thin film samples that can be exposed directly using the Nanoscribe for more accurate samples.

Acknowledgements

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