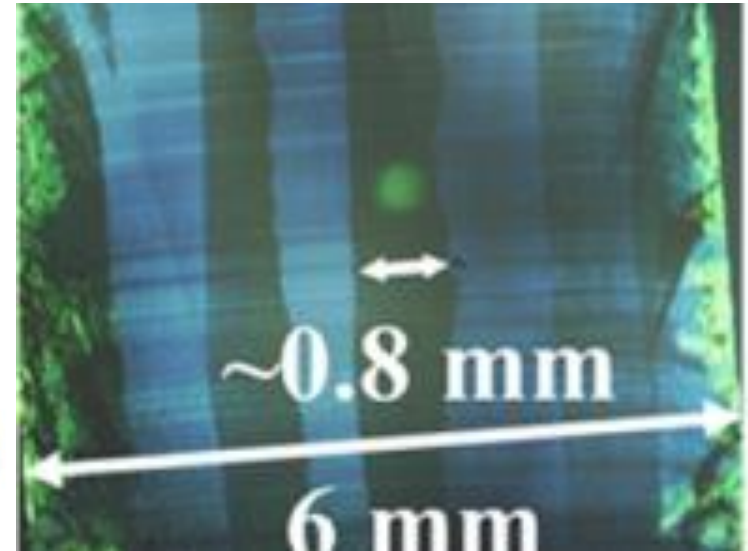
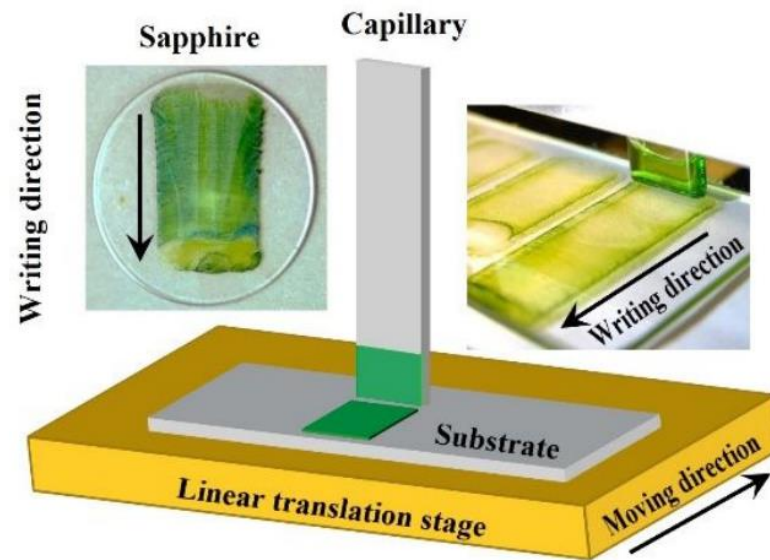
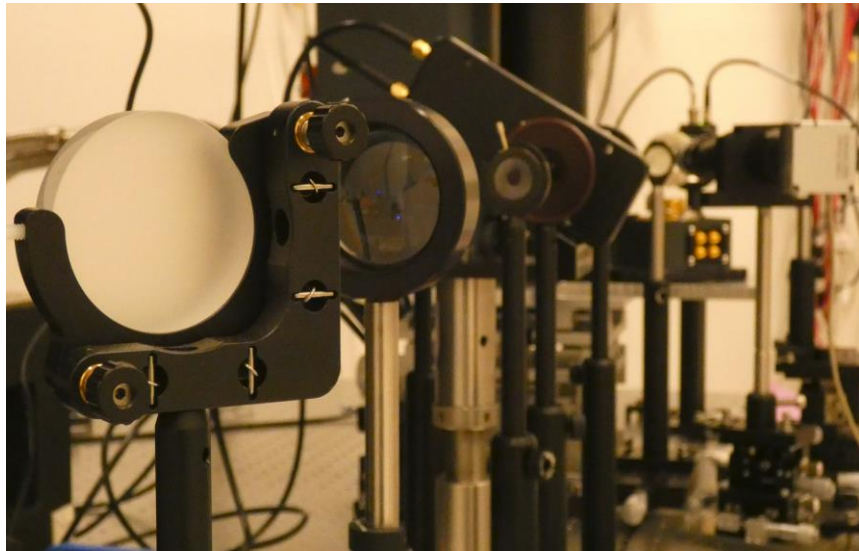




# Linear Dichroism (LD) Characterization of Solution Cast Organic Semiconductor Thin Films

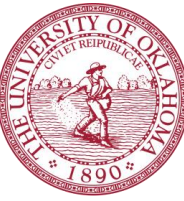


**Presenting : Hilbi Akbar**  
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*Homer L. Dodge Physics & Astronomy Department  
Center for Quantum Research Technologies  
University of Oklahoma*



# Important Concepts



## ➤ **Linear Polarization:**

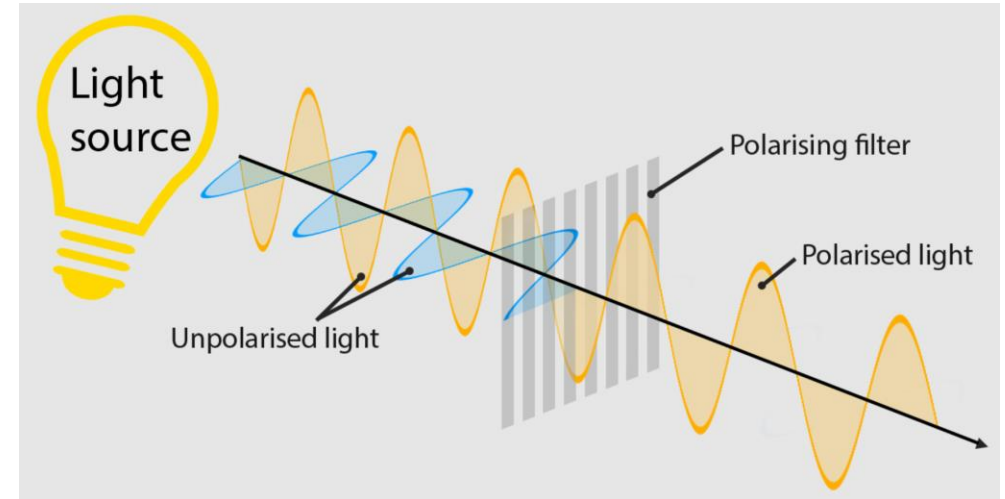
The direction of electric field vector does not vary with time or position

## ➤ **Absorption, Transmission & Emission:**

How much light is absorbed Vs how much passes through the sample.

## ➤ **Linear Dichroism (LD):**

- The effect of causing different polarizations to be absorbed by different amounts.
- The differential absorption between two orthogonal, linearly polarized states.
- Measurement of the sample's bulk property that is a result of the regular orientation of the molecules in the sample.



Source: Physics Stack Exchange

$$LD = A_x - A_y$$

OR

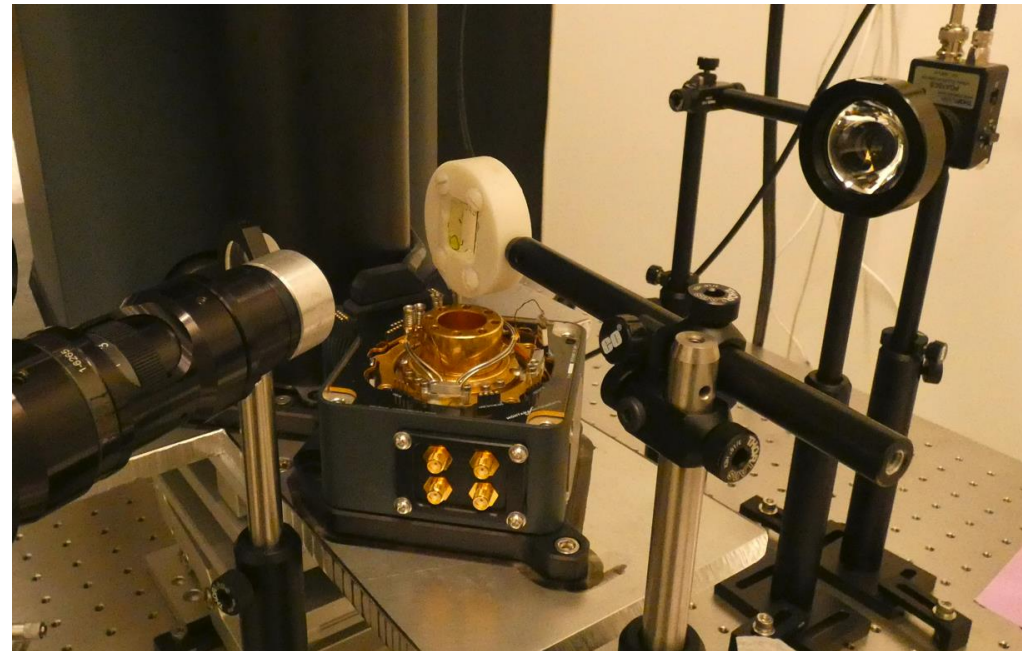
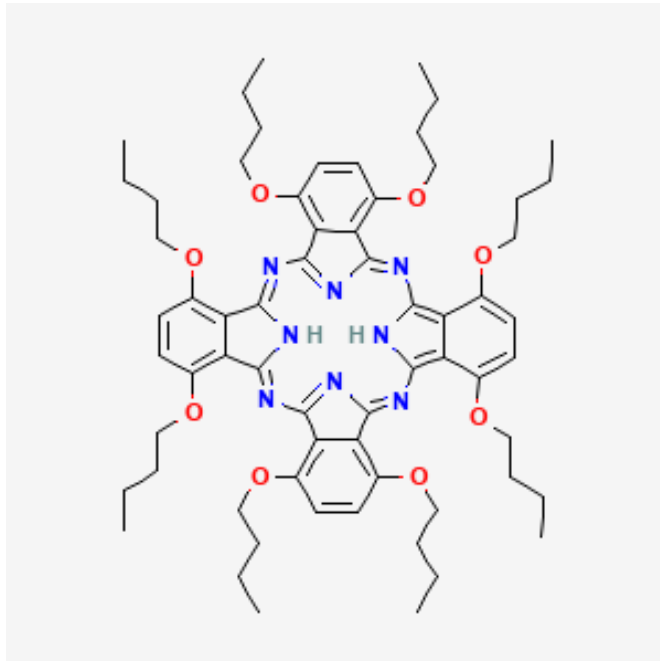
$$LD = A_{||} - A_{\perp}$$



# Question in simple words



How do the optical properties of organic thin films such as Phthalocyanines evolve with the changes in speeds, concentrations, and temperatures?



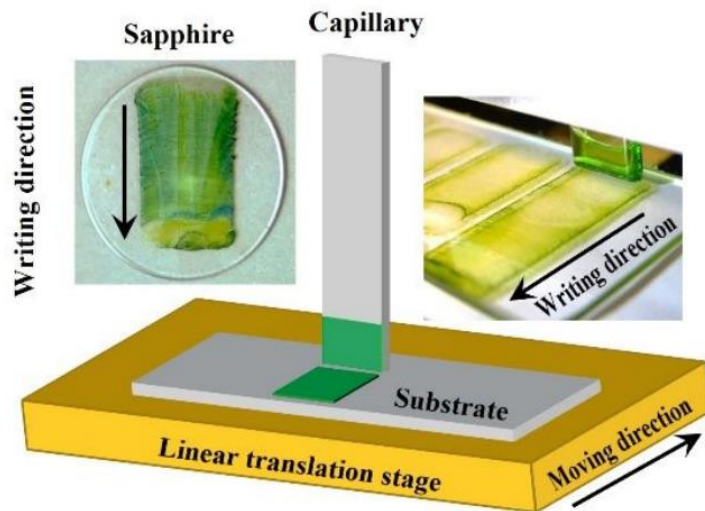


# Pen Writing & Spin-Coating

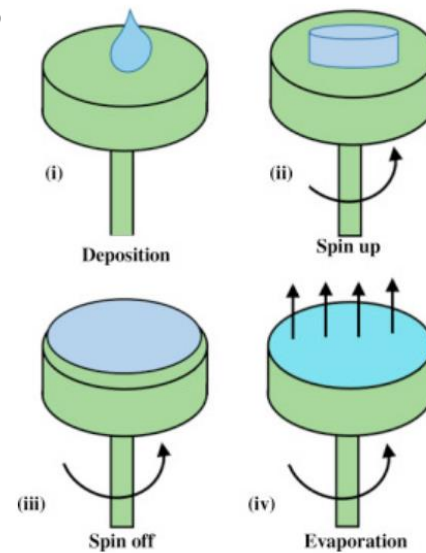


- Pen Writing method for making the **thin films**
- So far, I have worked with the following H2OBPc solutions in Toluene:

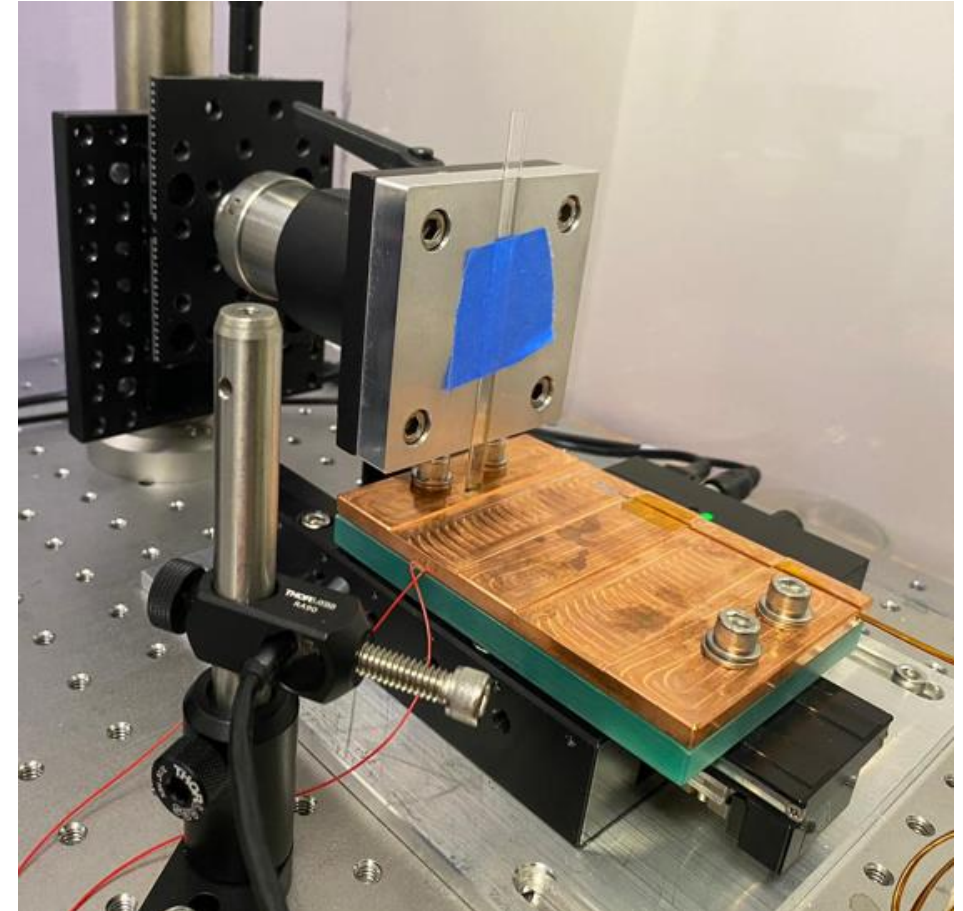
- 80um/s, 0.5%, heated
- 100um/s, 0.1%, heated
- 100um/s, 0.5%, room temp
- 180um/s, 0.5%, heated
- 300um/s, 0.5%, room temp



Pen Writing Stage



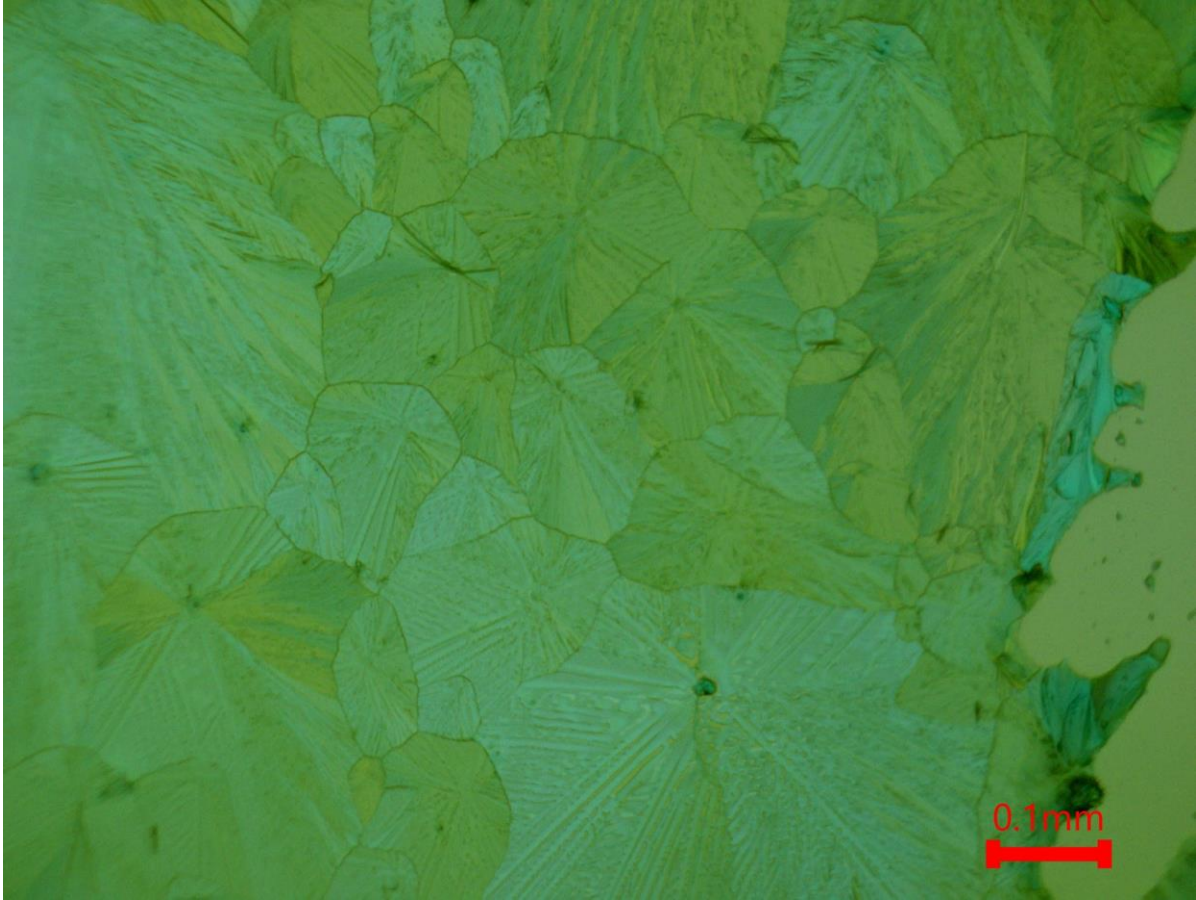
Spin Coating



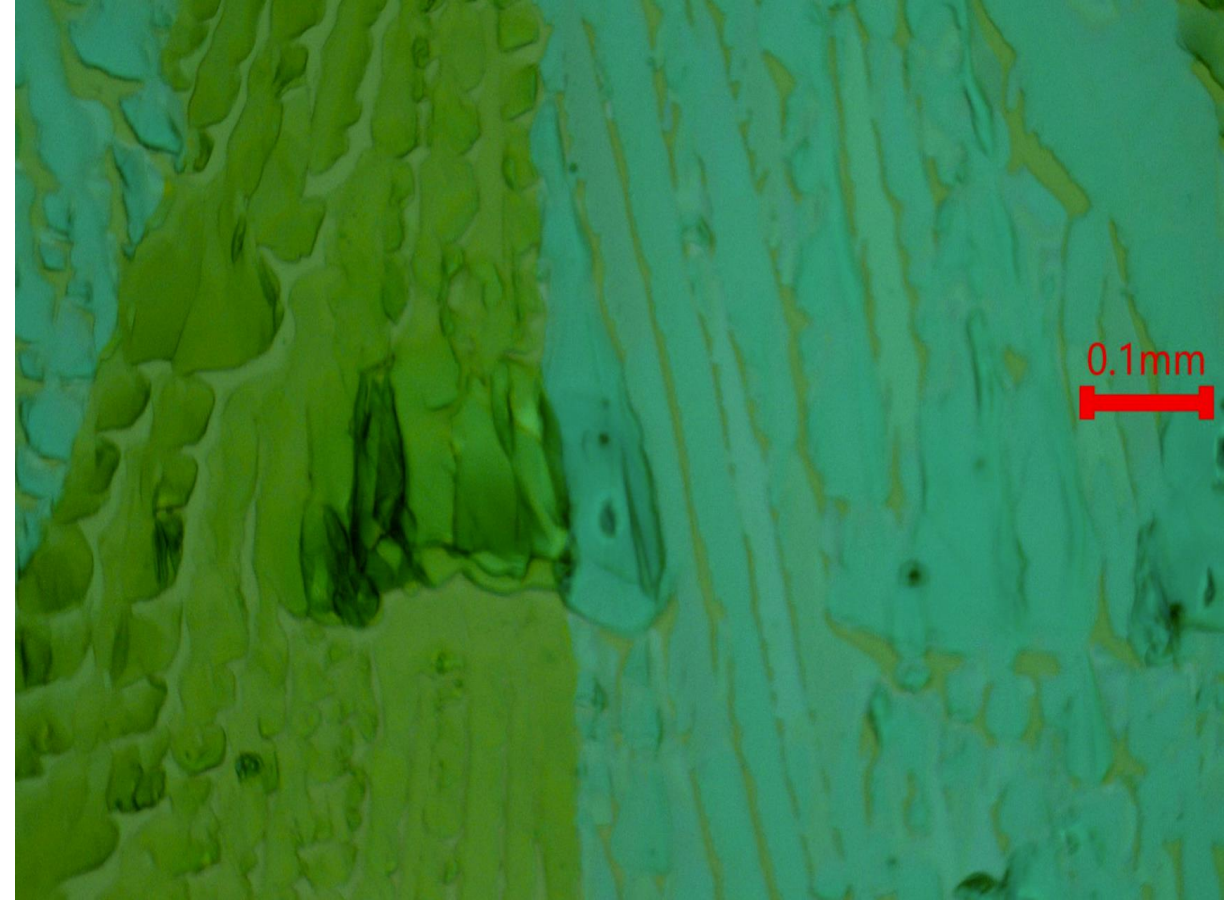
Pen Writing Stage



# Microscopic Imaging



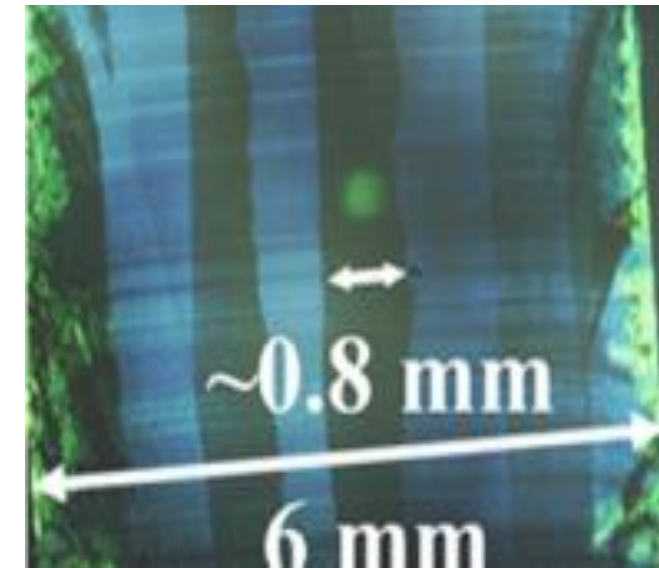
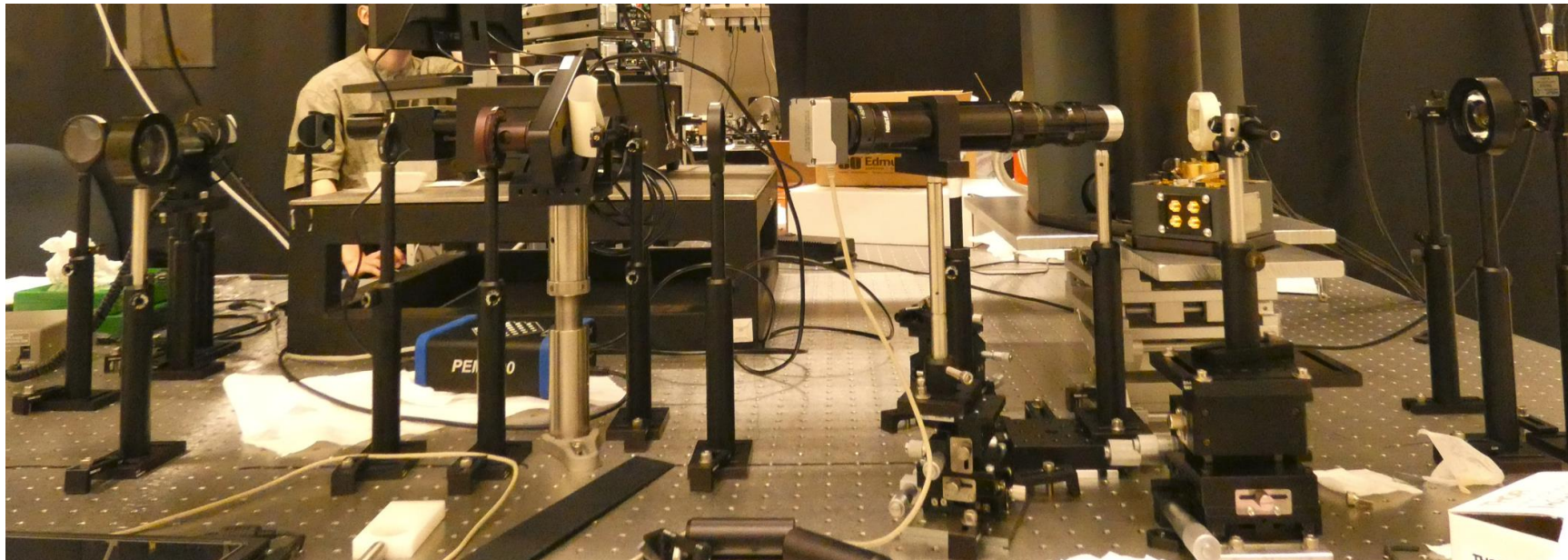
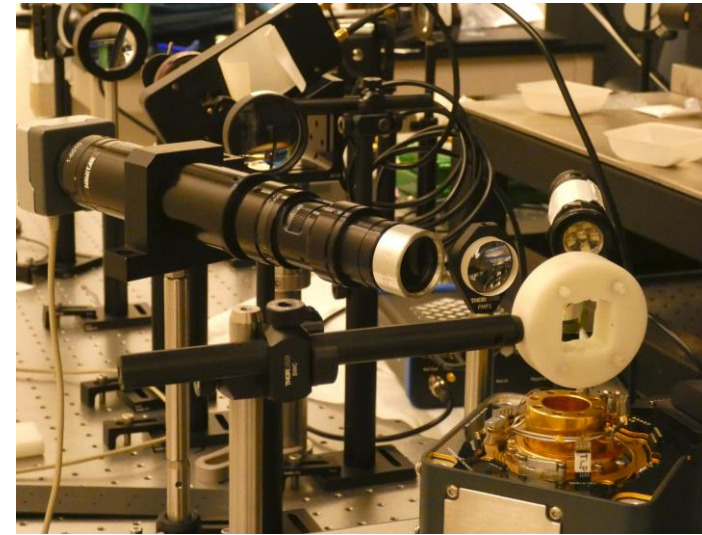
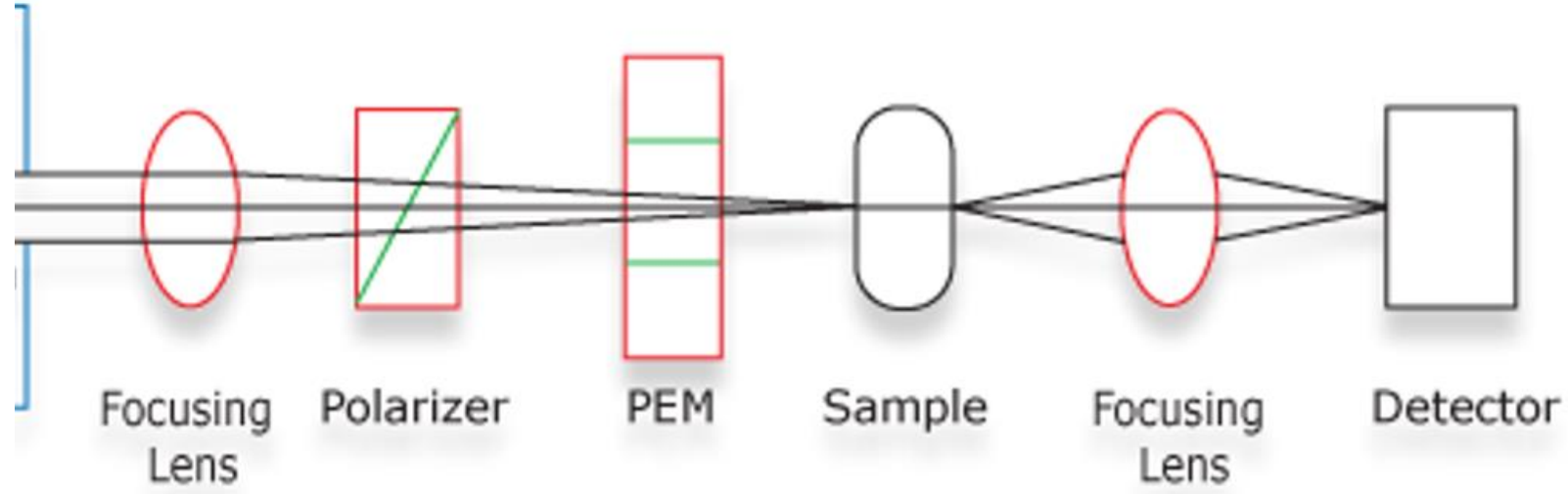
40 $\mu\text{m/s}$ , 0.5%, room temperature



16 $\mu\text{m/s}$ , 0.5%, room temperature



# Experimental Setup

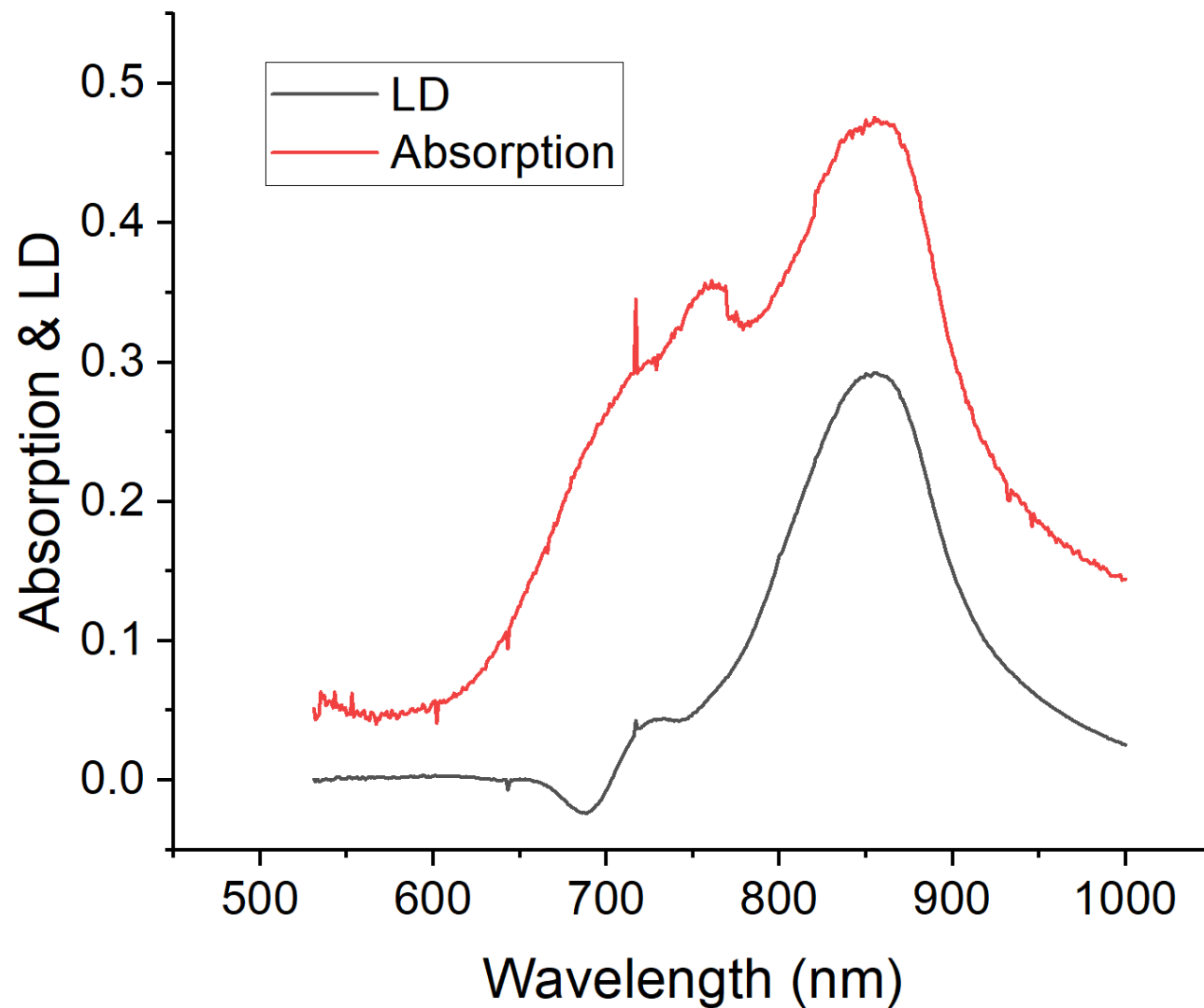




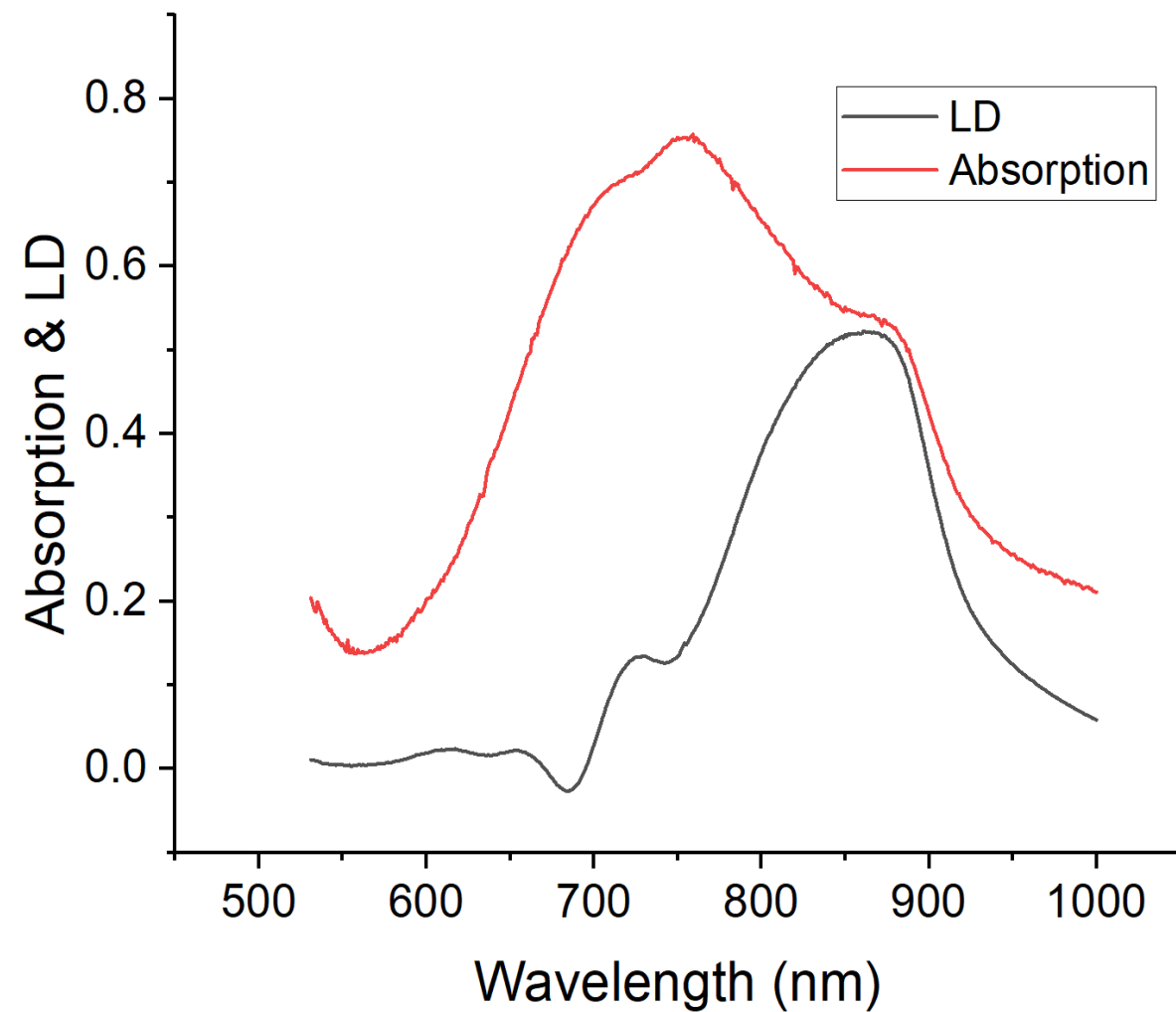
# Results for H<sub>2</sub>OBPc (Phthalocyanine)



100um/s, 0.1%, heated Sample



100um/s, 0.5%, heated Sample





# Significance of my research



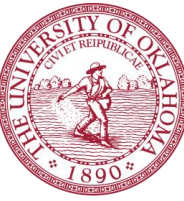
- Finding the structures of biological molecules such as the DNA
- Structures of materials: exciton orientation
- PVs in planes other than flat surfaces and non-transparent
- LCDs







# Acknowledgements / References



- [Dr. Madalina Furis](#)
- [Dr. Varun Mpara](#)
- [Tabassum Haque](#)
- [Hinata Yokoyama](#)
- [https://warwick.ac.uk/fac/sci/chemistry/research/arodger/arodgergroup/research\\_intro/linear\\_dichroism/](https://warwick.ac.uk/fac/sci/chemistry/research/arodger/arodgergroup/research_intro/linear_dichroism/)
- <https://physics.stackexchange.com/questions/231962/linear-polarized-3d-glasses-and-the-physical-shape-of-light-waves>
- <https://www.hindsinstruments.com/wp-content/uploads/PEM-Technical-Overview.pdf>



Questions?