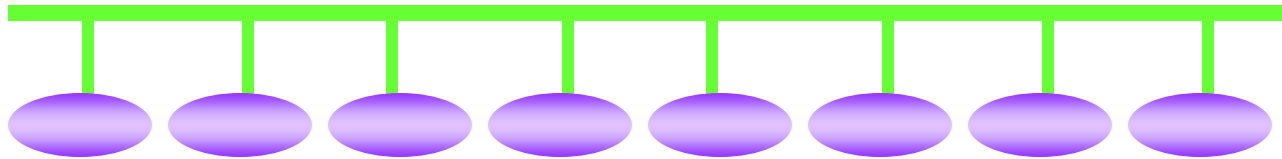


Characterization of Side-chain Liquid Crystalline Polypeptides



Meghan Powers, Biology, Santa Barbara City College
Katie Schaefer
Prof. Edward Kramer
Prof. Tim Deming



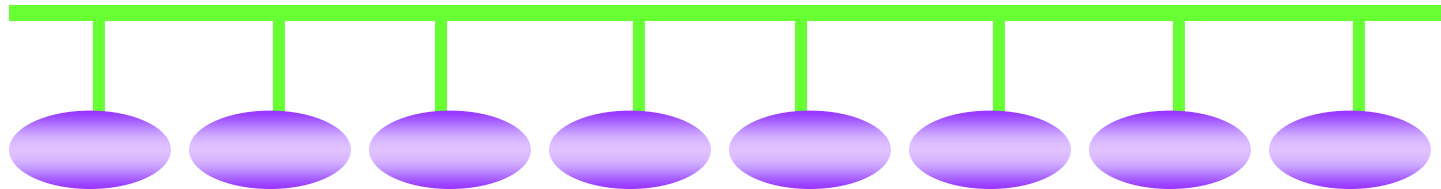
- **Project Description**

Characterization of the thermotropic mesogen and of the poly(L-lysine) backbone as separate components in order to understand the thermal dependence of liquid crystal transitions.

- **Techniques**

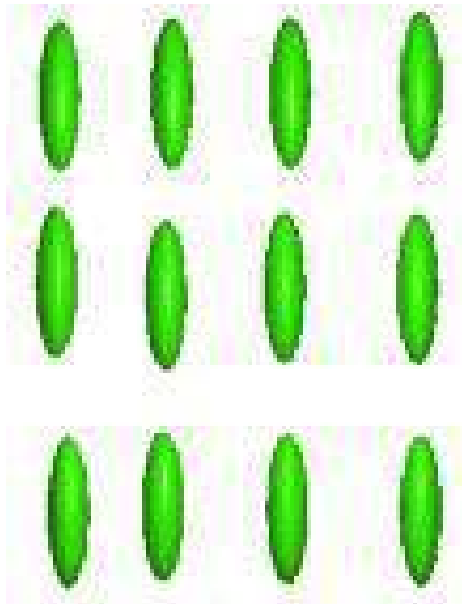
Differential Scanning Calorimetry

Optical Microscopy

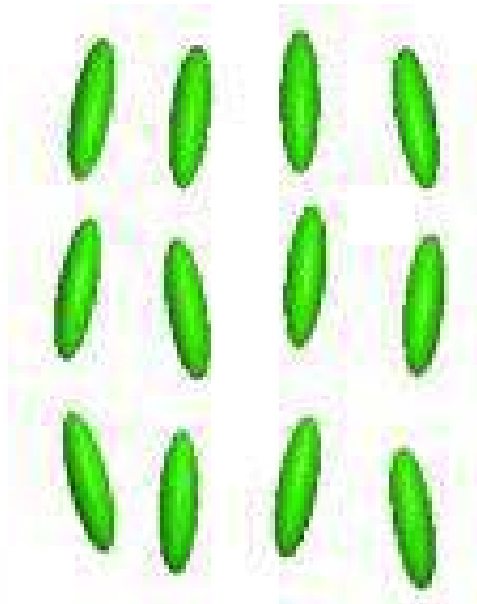


Liquid Crystals

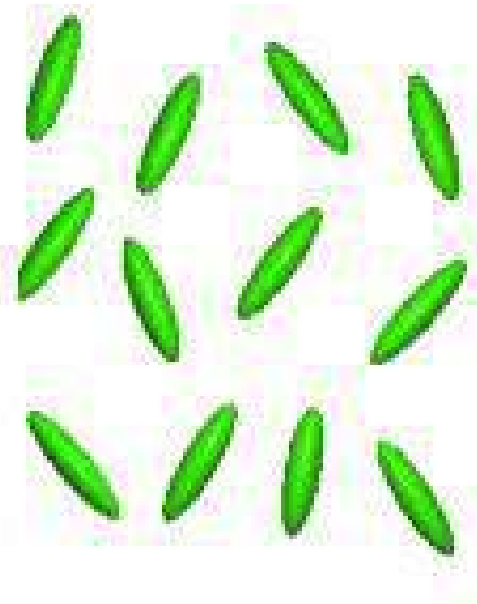
a thermodynamic stable phase characterized by anisotropy of properties generally lying in the temperature range between the solid and isotropic liquid phase



Solid



Liquid Crystal



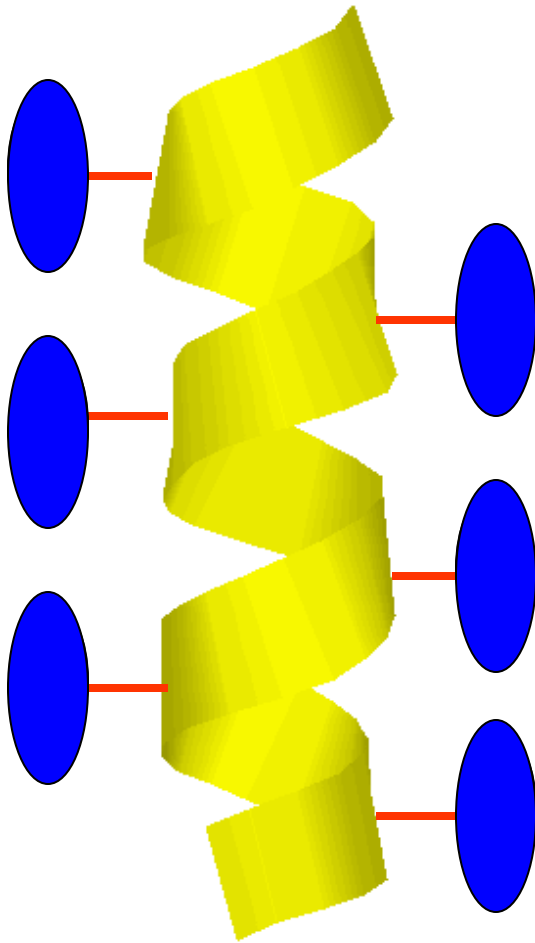
Liquid

<http://plc.cwru.edu/tutorial/enhanced/files/textbook.htm>

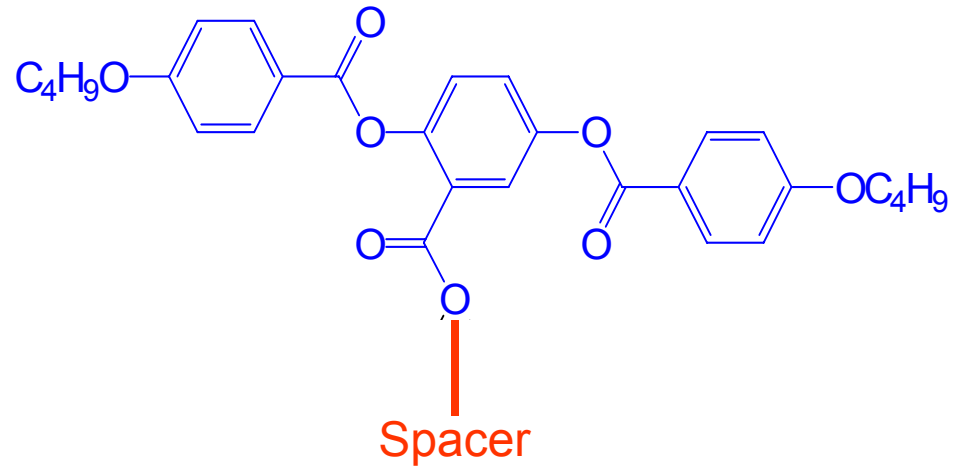
Anisotropic: Having properties which vary depending on the direction of measurement.

Birefringence: anisotropic optical properties

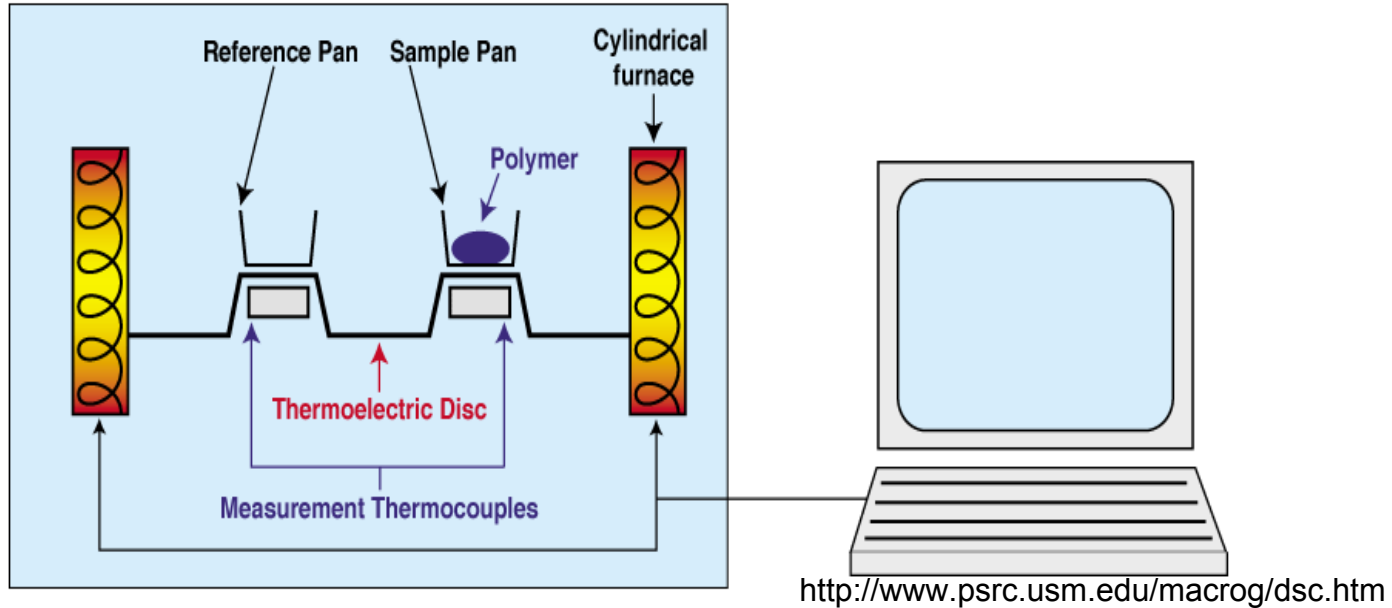
Structure of Polypeptide



- Backbone: Lysine
- Spacer: $(\text{CH}_2)_n$ $n=3,5,10$
- Mesogen: liquid crystalline material



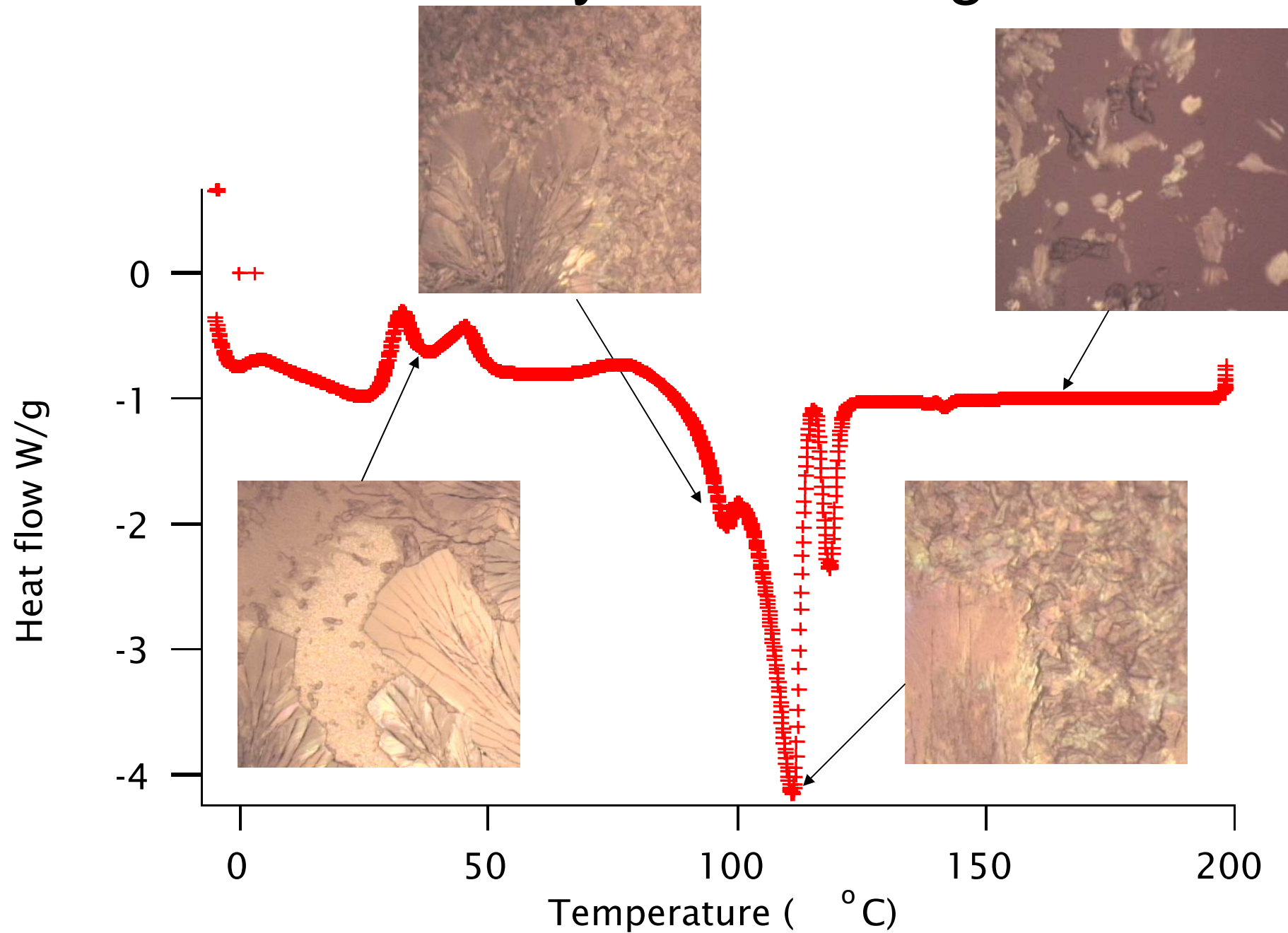
Differential Scanning Calorimetry



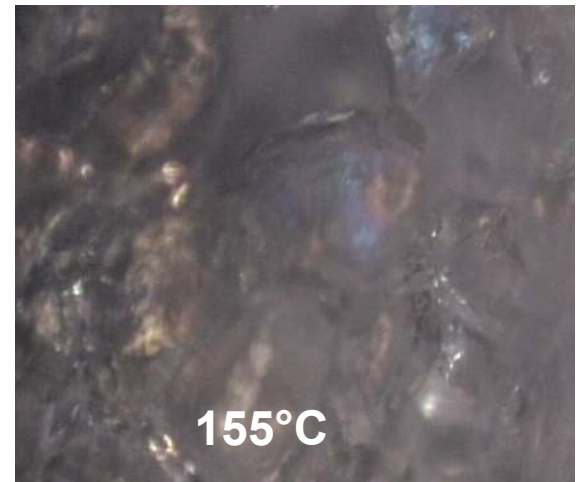
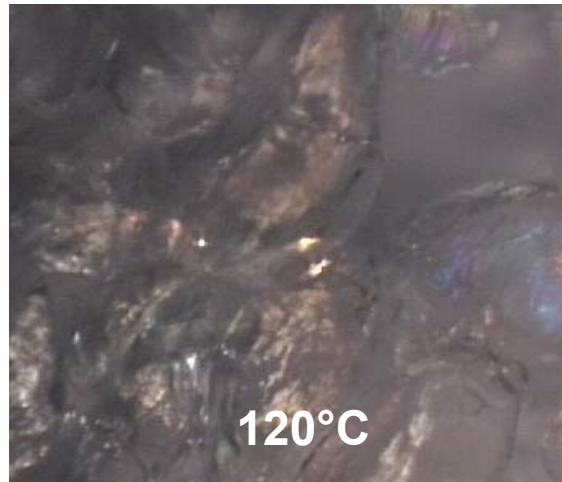
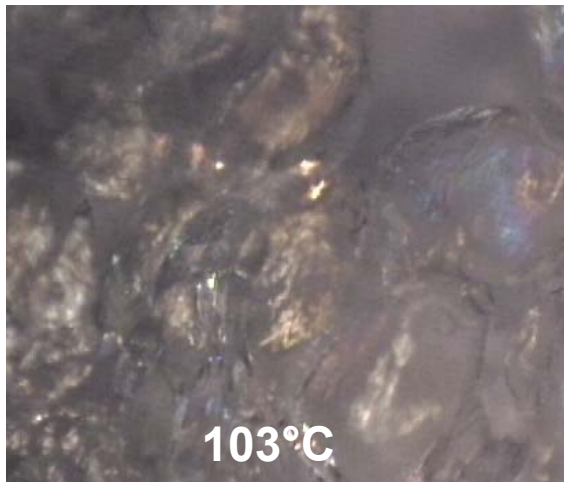
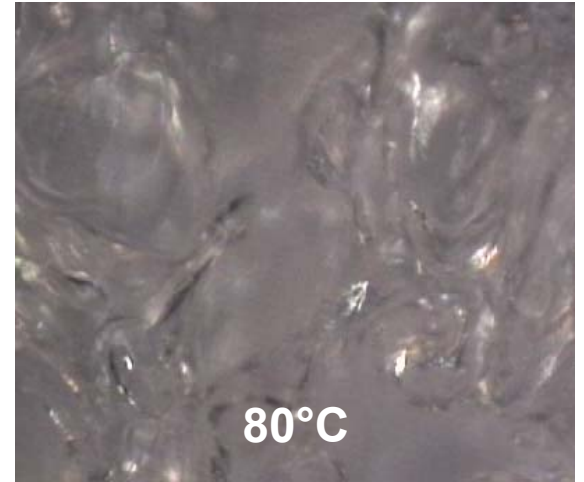
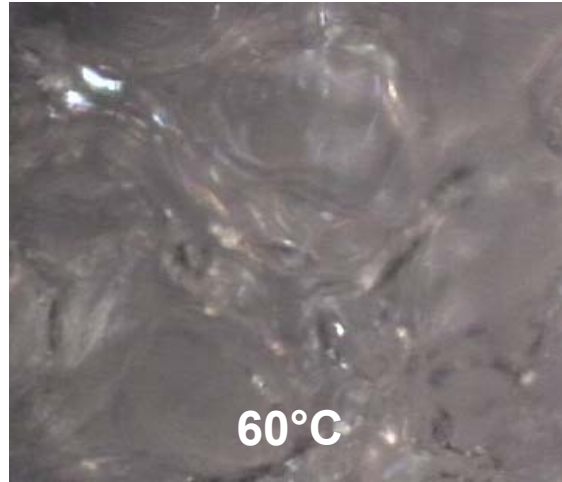
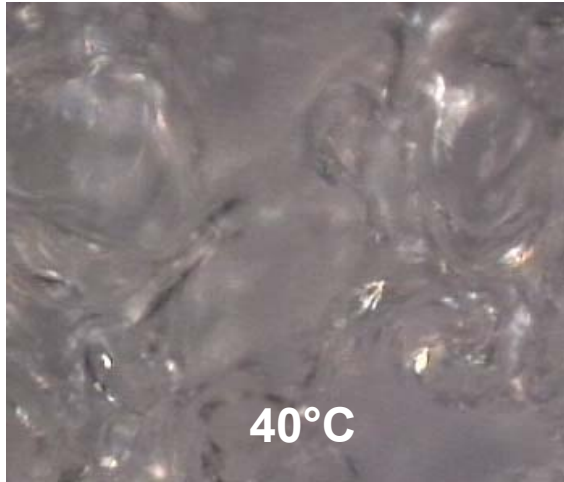
Polarized Optical Microscopy

Used to observe birefringence in crystalline or liquid crystalline materials in order to detect phase changes.

DSC Analysis of Mesogen

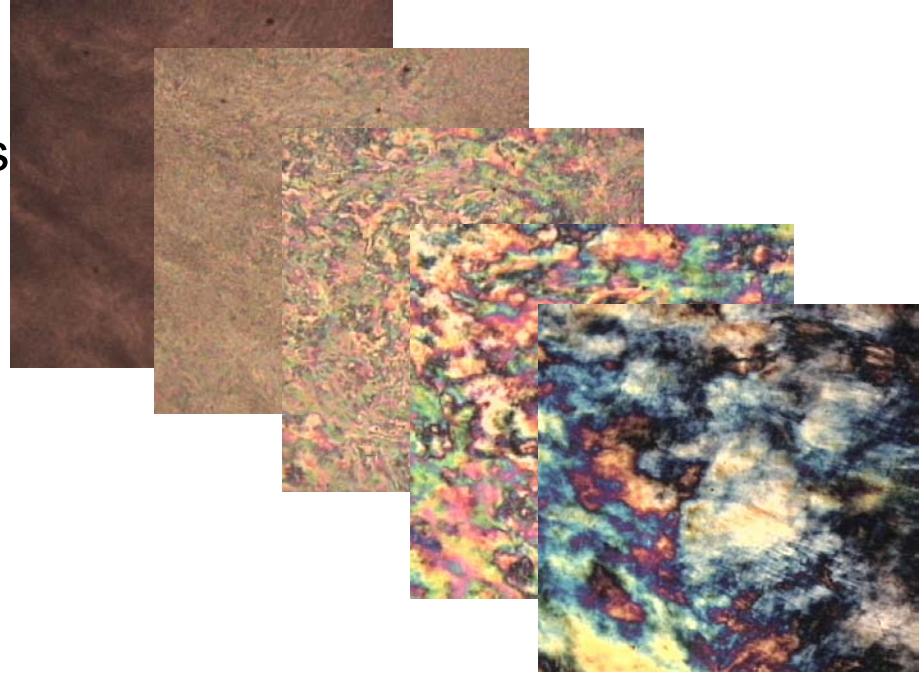


Optical Analysis (10X) of Poly(Z-lys)



Characteristics of Mesogen

- Low temperature anisotropic phases melt into isotropic liquid
- Formation of hard crystalline structures after cooling

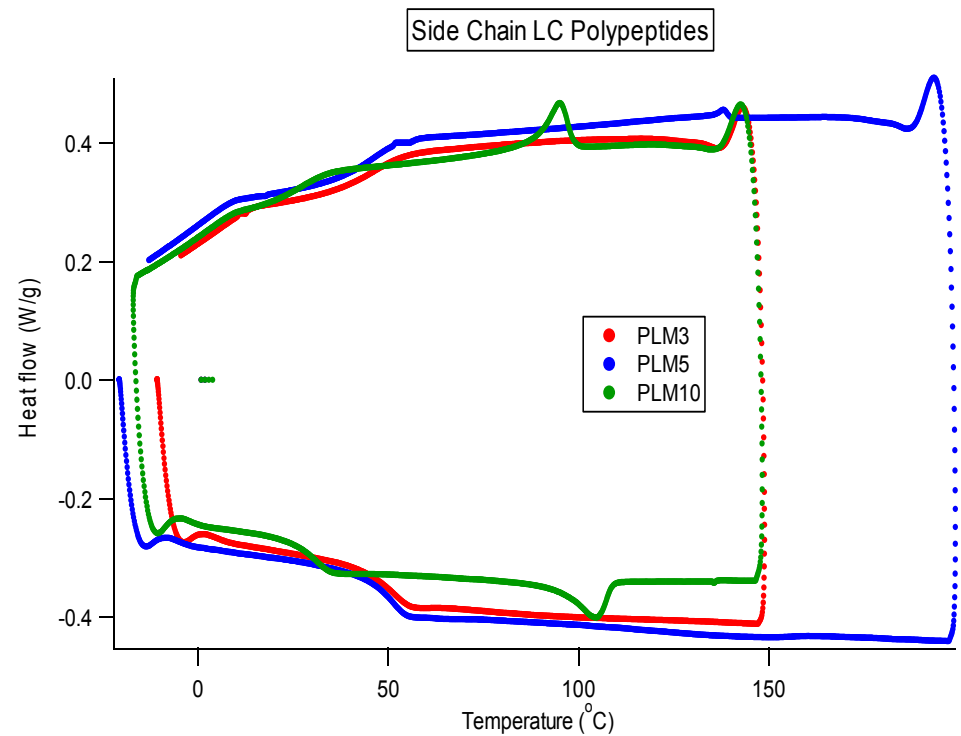


Characteristics of Poly(Z-lys)

- Hard glassy properties below glass transition
- Structure becomes rubbery above glass transition, no melting point

Characteristics of Homopolymers

- Glassy below T_g , rubbery above T_g
- Anisotropic liquid crystalline phases characteristic of mesogen
- Thermal transitions are reversible



Future Plans

DSC on Poly(Z-lys)

X-ray diffraction on components and homopolymers

Synthesis of random copolymers of lysine and mesogenic lysine

Acknowledgments

Katie Schaefer

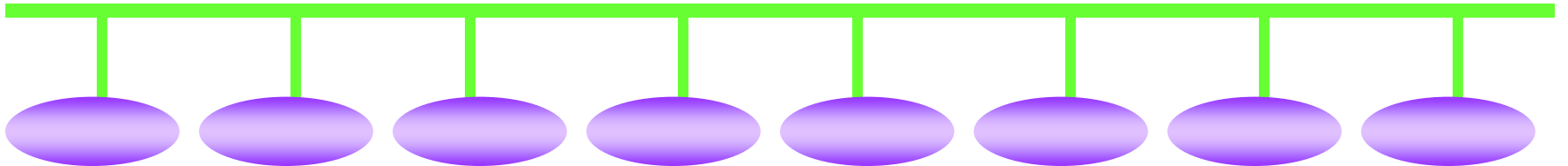
The Kramer Group

Ed Kramer

The Deming Group

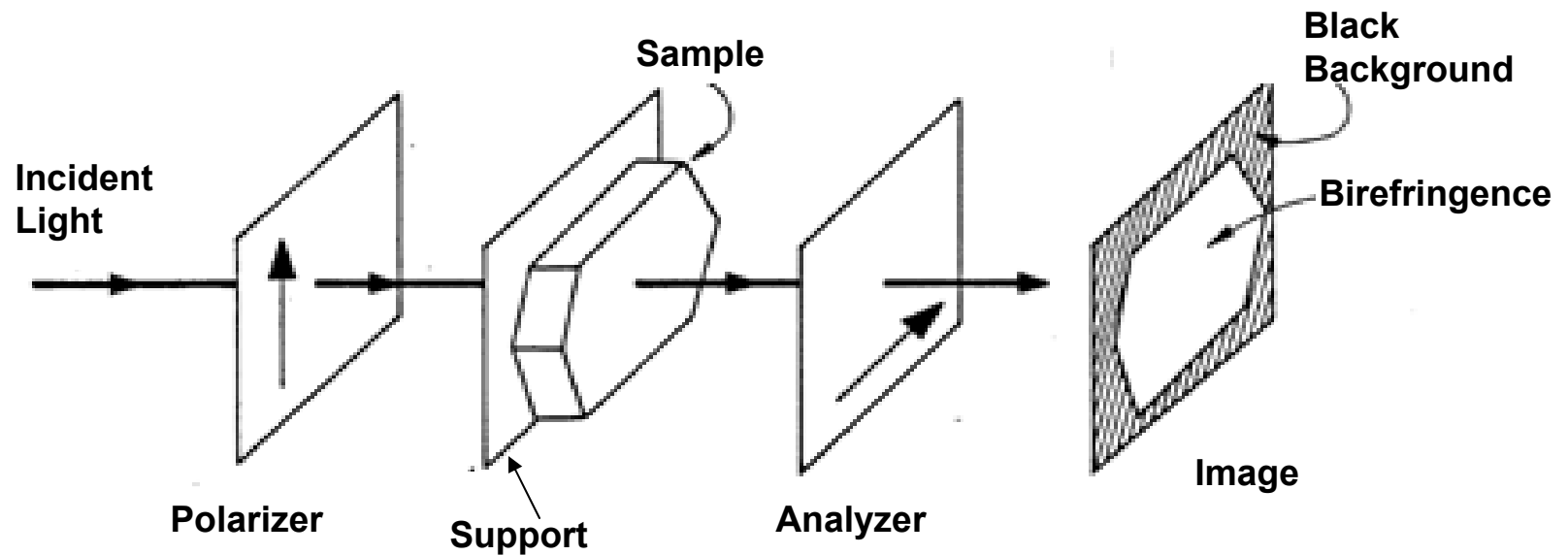
Krystyna Brzezinska

INSET



Polarized Optical Microscopy

Used to observe birefringence in crystalline or liquid crystalline materials in order to detect phase changes.



DSC Rate Analysis of Plm-10

