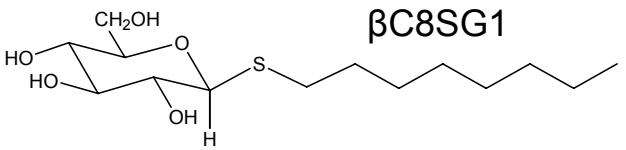
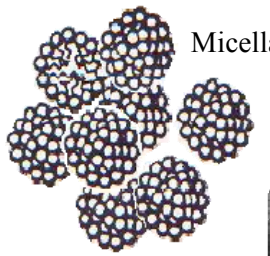
Determination of Phase Diagrams of Biologically Relevant Liquid Crystals

Kristen Chellis, Gerald R. Van Hecke, Kerry K. Karukstis

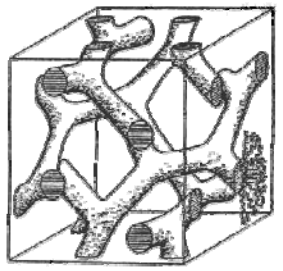
Background. Liquid crystalline phases, or mesophases, are semi-ordered phases in which the molecules all tend to align in a common direction. Thermotropic mesophases form depending on the temperature of the substance. Lyotropic mesophases depend on the interactions between a solvent and a solute. Amphitropic mesophases display the properties of thermotropic and lyotropic mesophases. Alkylglucosides are environmentally safe nonionic surfactants that display amphitropic liquid crystal phases. Many of these phases are similar to biological membranes and are useful in drug delivery and cosmetics. *n*-octyl-β-D-thioglucoside (βC8SG1) forms micellar, cubic, and lamellar phases.

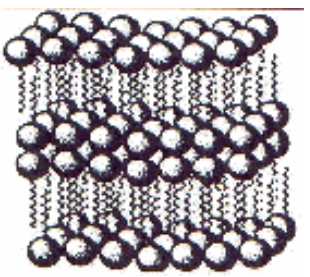




Micellar

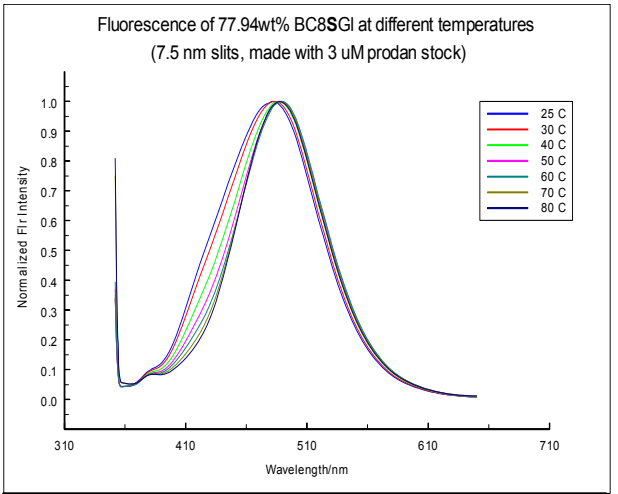
Cubic

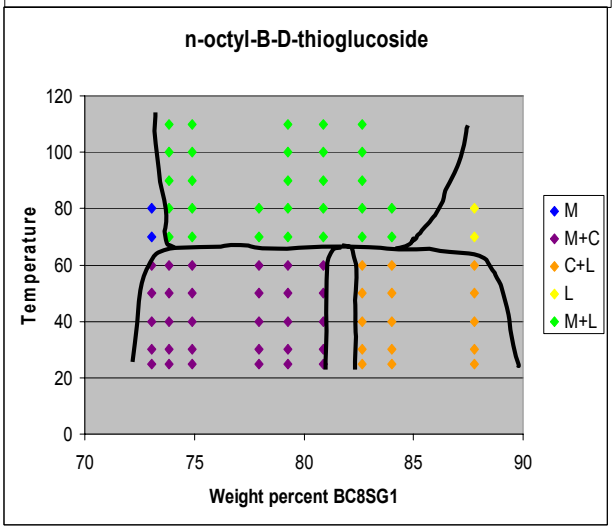




Lamellar

Fluorescence spectroscopy with a prodan probe offers a highly sensitive method for detecting the phases in liquid crystal systems. It is a simple method for determining phase diagrams by a single process, and allows for more accurate detection of two phase regions. The fluorescence spectrometer uses a 340 nm excitation and measures the resulting fluorescence emission. Prodan in each phase will emit a characteristic wavelength between 350 and 650 nm. The phases that are present can be determined by noting the peak maximum and shoulders of the fluorescence spectra. The lamellar and micellar phases have high peak wavelengths (480-500nm), while the cubic and gel phases have low peak wavelengths (400-440nm).





Funded by NSF REU CHE-0648597