

Physics 410/510  
Experiment 0-11  
Polarized Light, Optical Activity, Magneto-optics,

Part I: (Somewhat qualitative and general)

Study the polarization of light produced by a reflecting dielectric, by a polaroid screen, by a doubly refracting substance, by a Nicol prism, by a quarter-wave plate and a half-wave plate, by a Fresnel rhomb and by scattering; observe the rotation of the plane of polarization of plane polarized light by optically active substances (quartz), and the effect of cellophane and of a stressed plastic bar on plane polarized light.

References (\* means: copies in instruction book):

- \* Monk, "Light--Principles and Experiments" pp. 395-414.
- Taylor, "College Manual of Optics" pp. 138-181 (experiments).
- Jenkins and White, "Fundamentals of Optics" pertinent sections

Part II: (Quantitative measurements)

Derive the specific rotation of right and left turning sugar from measurements on the rotation of the plane of polarization of 5461A light, rotation being produced by solutions of at least three different concentrations; obtain Verdet's constant for the rotation produced on the same light by magnetic field acting on CS<sub>2</sub> (the field must be measured at one current over 1/2 the full length of the cell to obtain its average for that or any other current--be sure to have the solenoid water cooled to prevent undue CS<sub>2</sub> heating and possible resultant damage to the cell---but take it easy on opening the cooling water valve--water pressure is high); check linearity of rotation (and reversal) with field. Measure the Faraday rotation in Cd<sub>1-x</sub>Mn<sub>x</sub>Te crystals, for x = 0.45, using a He-Ne laser (633 nm). Determine the Verdet constant. The papers by Hugonnard-Bruyere et al. (in instruction book), Aksionov et al., and Butler are useful references.

References:

- Jenkins and White, "Fundamentals of Optics" Chapters 27 and 29.
- \* Houston, "Treatise on Light" Chapter 13
- \* R.W. Wood, "Physical Optics" appropriate sections.
- \* K. D. Moeller, "Optics", University Science Books, CA 1988.
- \* E. Hecht, A. Zajac, "Optics", Addison-Wesley 1979
- \* S. Hugonnard-Bruyere et al., Phys. Rev. B50, 2200 (1994)
- \* D. A. Aksionov et al., Sensors and Actuators A21 (1990)
- \* M. A. Butler, Solid State Commun. 62, 45 (1987)