

## LAB 9: Polarization

### Results (Polarization)

The polarimeter is used for the determination of the concentration of optically active substances. For this a sodium light with a wavelength of 589 (nm) is linearly polarized by means of a polarizer. This light passes through the solution to be investigated and is observed through an analyzer. Optically active substances rotate the polarization plane. By measuring the rotational angle by means of the analyzer, the concentration of the solution can now be calculated using the following relation :

$$s = \frac{\theta}{L \cdot c}$$

$$\rightarrow \theta = s \cdot L \cdot c \quad \rightarrow \text{slope} = \frac{\theta}{c}$$

$$\theta \propto L$$

$$\theta \propto c$$

**a) Determination of the length of the tube(optical path)**

$$L = 200 \text{ (mm)} = 2 \text{ (dm)}$$

**b) Optical zeroing (calibration)**

1. Switch on the sodium lamp and wait a short time for it to warm up.
2. Turn the analyzer with the adjustment screw to  $0^\circ$  so that the circle is uniformly lit (**dark**), i.e. so that no central line is visible. When the analyzer is turned about the zero position the central line and the two edge areas become light or dark. For this reason deviations from the zero position can very easily be observed.

**c) Filling a round cuvette (tube)**

1. Hold the tube vertical so that the thicker part is at the top.
2. Take off the upper screw ring; remove the internal cap, sealing ring and glass disc.
3. Fill the tube with the liquid to be investigated with as few bubbles as possible.
4. Replace the glass disc, sealing ring and internal cap and tighten with the screw ring.

**d) Determination of the angle of rotation ( $\theta$ )**

1. Place the tube with the liquid to be investigated into the sample chamber Turn the analyzer with the adjustment screw in such a way that the observed circle is again uniformly (**dark**).
2. Read the angle of rotation  $\theta$  from the scale by means of the vernier scale

| $c \text{ (}\% \text{)}$ | $\theta \text{ (}^\circ \text{)}$ |
|--------------------------|-----------------------------------|
| 0%                       | $\theta = 0$                      |
| 5%                       | 3.8                               |
| 10%                      | 6.6                               |
| 15%                      | 10.3                              |
| 20%                      | 13.8                              |
| Unknown                  | 5.2                               |

Slope = 0.7  
 unknown  $\Rightarrow c = 7.3$   
 $\theta = 5.2$

$$L = 200 \text{ mm} = 2 \text{ dm}$$

$$s = \frac{\text{Slope}}{L} = \frac{0.7}{2} = 0.35 \text{ (dm)}^{-1}$$

# Polarization Answers Sheet

**Ying Liu**



## **Polarization Answers Sheet:**

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