

Experiment - 8

Aim:

To verify Brewster's law and find the Brewster's angle for given material.

Apparatus:

- Brewster's experiment setup,
- Online Virtual Simulator.

Theory:

An ordinary light source consists of a very large number of randomly oriented atomic emitters.

They radiate polarised wave trains for roughly 10^{-8} seconds. These wave trains combine to form a single resultant polarised wave train for not more than 10^{-8} seconds.

A light is said to be plane polarised light, if all the vibrations are confined to a single plane.

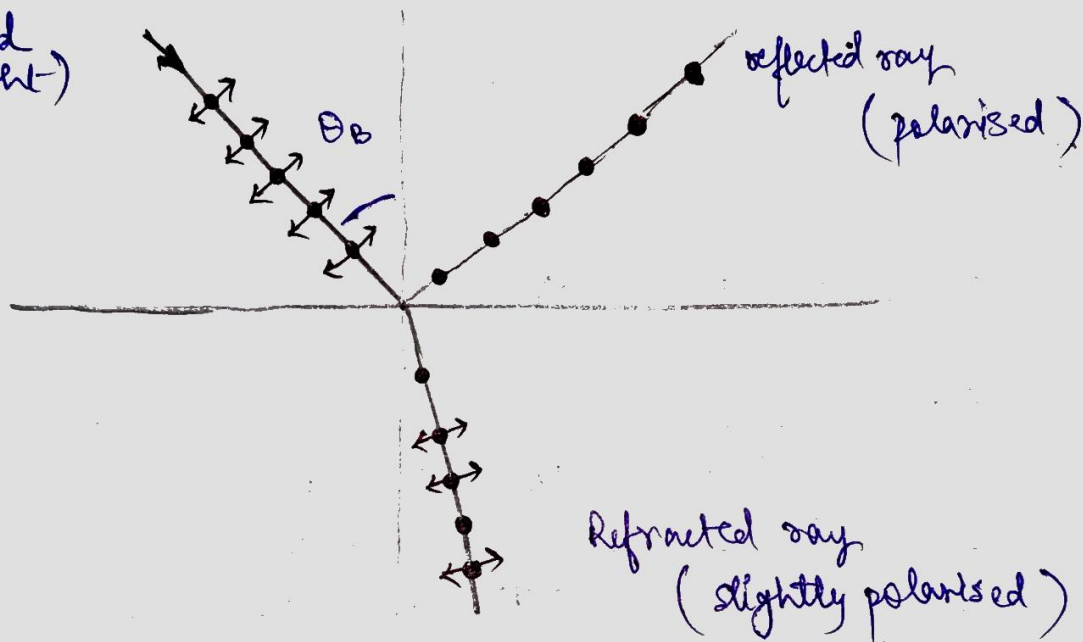
Consider an unpolarised light incident on a transparent surface. If angle of incidence is equal to a particular angle, the reflected light will be completely plane polarised. This angle is called Brewster's angle θ_B .

Sir David Brewster, in 1842 found that maximum polarization of reflected ray occurs when reflected ray is \perp to incident ray.

$$\tan \theta_B = \frac{\mu_2}{\mu_1}$$

$$\tan \theta_B = \frac{\mu_2}{\mu_1}$$

Incident Ray
(unpolarised light)



S.No.	Incidence Angle	Topaz ($\mu = 1.607$)	Crown glass ($\mu = 1.52$)	Flint glass ($\mu = 1.57$)
1.	0°	10.9945	10.9920	10.9936
2.	10°	10.981	10.9734	10.9782
3.	15°	10.8391	10.9208	10.9332
4.	20°	10.6032	10.7886	10.8195
5.	25°	10.1246	10.4953	10.561
6.	30°	9.2719	9.9219	10.0444
7.	35°	7.9472	8.989	9.1385
8.	40°	6.1741	7.4743	7.7552
9.	45°	4.1734	5.603	5.9387
10.	50°	2.3588	3.6073	3.9356
11.	55°	1.2122	1.061	1.1385
12(i).	56.71°	—	<u>1.00</u>	—
12(ii)	57.5°	—	—	<u>1.000</u>
12(iii).	58.11°	<u>1.000</u>	—	—
13.	60°	1.0793	1.245	1.374
14.	65°	2.0020	2.4324	2.1735

Procedure :

- ↳ Select the laser to be used in experiment.
- ↳ Select the material to be used for experiment.
- ↳ Start the experiment by changing the angle of incidence.
- ↳ Record the observation for different angles of incidence.
- ↳ Repeat the experiment for different materials.

Result :

Brewster's angles for the following materials are :

$$\text{Topaz } (\mu = 1.607) = 58.11^\circ,$$

$$\text{Crown glass } (\mu = 1.52) = 56.71^\circ,$$

$$\text{Flint glass } (\mu = 1.57) = 57.5^\circ.$$