Date 1/2/2021

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Expt. Name Dispersive power

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EXPERIMENT - 2

Aim :

To determine the dispersive power of power prism.

Apparatus :

Spectrometer, prism, mercury lamp (light source) lens, virtual lab.

Principle :

When a beam of light strikes on the surface of transparent material (water, glass, quartz, crystal), the portion of light is transmitted has small deviation of path from incident angle, called refraction.

Refractive index of material of prism can be given by

$$\mu = \frac{\sin\left(\frac{A + \delta_m}{2}\right)}{\sin(A/2)}$$

$\delta_m \rightarrow$ angle of min. deviation

for Dispersive power,

$$\omega = \left(\frac{\mu_v - \mu_r}{\mu_y - 1}\right)$$

where μ_v, μ_r, μ_y are refractive indices of violet, red and yellow respectively.

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Procedure :

→ Turn the telescope, and focus on the cross wires.
→ Place the telescope parallel to collimator.
→ Place the collimator directed towards light source.

To determine the angle of prism :
→ Place the edge of prism, pointed towards collimator.
→ Move the telescope using slider to see the slit on side coincide it with crosswire, note the readings.
→ Move telescope to other side of lens and do the same.
→ Find the difference b/w 2 angles as 2θ. find angle of prism as θ.

To determine the angle of deviation :
→ Rotate given prism table to get refracted light through it.
→ Make the slit coincide with telescope.
→ Slowly rotate vernier table by using vernier fine adjusting slider.
→ Note the position of slit where it is stationary which is the minimum deviation.
→ Using the telescope fine adjusting slider, make coincide the slit with cross wire.

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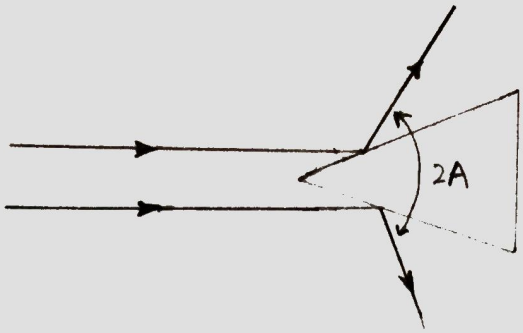

	V_1			V_2		
	MS	VS	TOTAL	MS	VS	TOTAL
light from one face	289.5	10	289°40′	110	10	110°10′
light from another face	50	40	50°40′	229.5	0	229°30′

Calculation :

$2A = V_1 - V_1' = 360 - (289°40' - 50°40')$

$2A = 121$

$A = 60°30'$.

$2A = V_2 - V_2' = 229°30' - 110°10'$

$2A = 119°20'$

$A = 59°40$.

Average $A = \frac{60°30' + 59°40'}{2} = 60°05'$

angle of prism = $60°05'$.

Colors	Reading at min. δ		Direct Reading		Difference (δm)		
	V_1	V_2	V_1	V_2	V_1^*	V_2^*	Mean
Red	290.216	110.166	247.5	67.5	42.716	42.666	42.691
Yellow	290.533	110.416	247.5	67.5	43.033	42.916	42.975
Violet	291.583	111.616	247.5	67.5	44.083	44.116	44.01

Calculations :

$$\mu_r = \frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(A/2\right)} = \frac{0.8126}{0.5253} = 1.5472$$

Similarly,

$\mu_y = 1.549$

$\mu_v = 1.563$

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Observations :

Least count of spectrometer = $\frac{N}{V} = \left(\frac{1}{60}\right)^{\circ}$

Angle of prism (A) = $60^{\circ}02'$.

$\mu_r = 1.542$, $\mu_y = 1.549$, $\mu_v = 1.563$

Dispersive power, $\omega = \frac{\mu_v - \mu_r}{\mu_y - 1}$

Result :

Dispersive power of the given prism is = 0.0382.

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