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Refractive Index of Hydrogen Gas Using Hollow Glass Prism, Zinc Dust and Concentrated H_2SO_4

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***Abstract*: Refractive Index of Hydrogen gas was obtained using hollow glass prism and Sodium source as a monochromatic light source. Hydrogen gas was prepared as a result of exothermic reaction where eight gram of Zinc dust and ten drops of concentrated Sulphuric acid were used as a reactant inside the hollow glass prism. Refractive index of hydrogen gas prepared at room temperature using hollow glass prism and Sodium Source (589nm) was found to be 1.0002.**

***Keywords*: Hollow glass prism, Hydrogen gas, Refractive index.**

1. Introduction

Inside the hollow glass prism eight gram of Zinc dust and ten drops of concentrated Sulphuric acid was used to prepare hydrogen gas. Zn (dust) + H2SO4 ⟶ ZnSO4 + H2 (gas) + heat [1]. Using spectrometer and Sodium source the experimental value of refractive index of Hydrogen gas was observed to be 1.0002. Shuster's method and prism formula was used to calculate refractive index [2], [3]. Refractive index of this medium might increase by adding more amount of Zinc dust and H2SO4 because by doing so there would be increase in density of hydrogen gas in prism [4].

2. Experiment

With use of spirit level, the Prism table, Collimator and telescope of spectrometer were aligned horizontally. Monochromatic sodium light source was used as a light source. Adjustment of cross wire on fine slit was confirmed. Prism was placed on prism table with the base parallel to collimator and telescope. At room temperature eight gram of zinc dust was injected inside hollow glass prism. Using dropper ten drops of concentrated Sulphuric acid were dropped on zinc dust inside the hollow glass prism. Immediately cap of hollow glass prism was closed. Angle of minimum deviation was obtained using Shuster's method [2]. This procedure was repeated three times to reduce error and to calculate mean of angle of minimum deviation. With angle of prism A=60° the prism formula.

$$\mu = \frac{\sin\{[A+\int m]/2\}}{\sin[A/2]} \quad [3]$$

Reduces to equation $\mu = 2*\sin[(60+\int m)/2]$ (1)

Where $\int m$ is mean of angle of minimum deviation and μ is the refractive index. Equation (1) was used to calculate refractive index of Hydrogen gas which was liberated in exothermic reaction [1].

$\int m = 0°0'50"$
$\mu = 2*\sin\{[A+\int m]/2\}$
$\mu = 1.0002$

3. Result and Discussion

Refractive index of the Hydrogen gas using hollow glass prism and monochromatic sodium source as a light source was found experimentally and was approximately 1.002.

4. Conclusion

In the laboratory hollow glass prism can be used to obtain refractive index of not only liquid medium but also of the gaseous medium.

5. Future Scope

If amount of drop of concentrated Sulphuric acid dropped on Zinc dust is increased, then refractive index of that particular medium of hydrogen gas may increase. This can be possible as increase in amount of H2SO4 may lead to increase in density of hydrogen gas in that medium which would increase refractive index of that medium [4].

Table 1
Observation table to calculate mean of angle of minimum deviation

S. No.	∫m position		Direct reading		difference		mean
	A'	B'	A	B	A'-A	B'-B	∫m
1	280°05'	100°21'	280°04'	100°20'	0°01'	0°01'	0°01'
2	280°03'	100°21'	280°03'	100°21'	0°	0°	0°
3	279°38'	99°59'	279°36'	99°58'	0°02'	0°01'	0°01'30"

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