Lab 5: Spectroscopy

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Abstract

1 Experiment 1: Emission Spectrum

1.1 Objective

The purpose of this experiment was to determine the wavelengths of the colors present in the emission spectrum of mercury vapor. This was accomplished by shining a beam emitted by mercury vapor through a diffraction grating that was then rotated. The angles at which each color revealed itself was recorded, and that angle was used to calculate the wavelength of the colors.

1.2 Theory

All the atoms of a particular element have a certain set of discrete energy levels to which atoms' electrons can be excited. When the electrons fall back down to their normal positions, a photon with energy equal to one of the energy levels is emitted. An element's set of energy levels is referred to as its emission spectrum.

The energy contained within these energy levels is determined with $E = \frac{hc}{\lambda}$. Since hc is a constant, the energy is dependent solely upon the wavelength, λ, which is the value we are finding in this experiment. While the wavelength of a particular color cannot be measured directly, it can be found with

$$\lambda = d \sin(\lambda) \tag{1}$$

where d is the distance between the lines of the diffraction grating and θ is the angle of diffraction for a color.

1.3 Equipment

1.4 Procedures

1.5 Data and Analysis

1.6 Conclusion

2 Experiment 2: Absorption Spectrum

2.1 Objective

2.2 Theory

2.3 Equipment

2.4 Procedures

2.5 Data and Analysis

2.6 Conclusion