International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 7 ǁ July 2022 ǁ PP. 133-135

Absorption Analysis of solution Potassium chromate (k_2CrO_4)

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ABSTRACT
The spectrum absorbed by the solution Potassium chromate (k_2CrO_4) determined using Double Beam UV/VIS Spectrophotometer and plotted the graph between concentration and absorption. The cubate contained distilled water in reference cell and absorption measured at different wavelengths using the cubate which contained Potassium chromate of concentration .207 mole/lt in Sample cell. The concentration of Potassium chromate determined at wavelength 626 nm.
Keyword*: Double Beam UV-Visible Spectrophotometer.*

Date of Submission: 24-06-2022 Date of acceptance: 05-07-2022

I. INTRODUCTION

Ultraviolet-Visible Spectrophotometer is a technique mostly used in Pharmaceutical analysis. In this technique the amount of visible radiation absorbed by the solution is measured and the functions of ratio of the intensity of double beams of light measured in UV-Visible reason by the instrument is called ultraviolet - Visible Spectrophotometer [1-3] .

Under the branch of science, the structure of atoms and molecules is studied and is a powerful tool for studying the interaction between matter and electromagnetic radiation and by this detailed analysis of any sample can be done [4-5].

All known frequencies and their wavelength of electromagnetic radiation or photon known as electromagnetic spectrum. Electromagnetic spectrum is the specific distribution of electromagnetic radiation according to frequencies and wavelength. The Electromagnetic wave have wide range of frequencies, wavelength and photon energies and electromagnetic wave travel with a speed of light in a vacuum. An important aspect of spectroscopy is the study of the propagation of light through matter. Whereas before the twentieth century, physicists considered the spectrum of light to be continuous and infinite [6]. For characterize matter and its study all types of electromagnetic radiation can be used in spectroscopy.

Any chemical compound can absorbs, transmits or restricts light over a range of certain wavelength (electromagnetic radiation). When an amount of intensity of light passed through a sample solution of substance the amount of light intensity absorbed and transmitted is called spectrophotometry. The concentration of the substance can also be detected with the help of spectrophotometer by measuring the intensity of light [7]. The intensity of light classified into two different ways , depending on the range of wavelength of light source:

Ultraviolet-visible spectrophotometer uses wavelength of light over the UV-range 185nm to 400nm and visible range 400nm to 700 nm of electromagnetic spectrum of radiation .

Infrared spectrophotometer uses light over the range of infrared 700nm to 15000nm of electromagnetic spectrum of radiation .

In this paper we have measured the absorbance and concentration of Potassium chromate solution. The solution of the substance absorbed the amount of intensity of light is dictated by the concentration of that substance. Absorption decreases as the concentration is decreased by dilution. Which is the statement of Beer's-Lambert .

Potassium chromate Properties

It is the yellow solid potassium salt of chromate anion and is a
The formula potassium chromate is k_2CrO_4. It is a odorless and taste is bitter .
It emits chromium fumes that are toxic when heated .Potassium chromate can affect
our body parts when comes in contact. It is also known as bi potassium chromate .
It consist of two agents chromate and potassium. The ratio of chromate and potassium
is 1:2. The potassium chromate is oxidizing agent.
Appearance: Powder contain yellow color
Chemical formula: K_2CrO_4
Molar Mass: 194.19 $g.mol^{-1}$

Boiling point: 1,000 °C (1,830 °F; 1,270 K)
Density: 2.7320g/cm^3
Melting Point: 968 °C (1,774 °F; 1,241 K)
Magnetic Susceptibility: -3.9×10^{-6} cm^3/mol
Refractive Index: 1.74
Crystal Structure: Rhombic

Calculations

Wavelength range = 396 -700 nm
Molecular weight of potassium chromate = 194.1926 gm
Quantity taken (potassium chromate) = 2.51 gm
Water (distilled) = 60 ml
Weight of solution = 62.51 ml = .06251 litr

$$\text{Molarity} = \frac{\text{no. of mole}}{\text{solution (in litr)}}$$

$$\text{No. of moles} = \frac{2.51 \text{ gm}}{194.1926 \text{ gm}} = 0.01292$$

$$\text{Molarity} = \frac{0.01292}{62.51} \times 1000$$

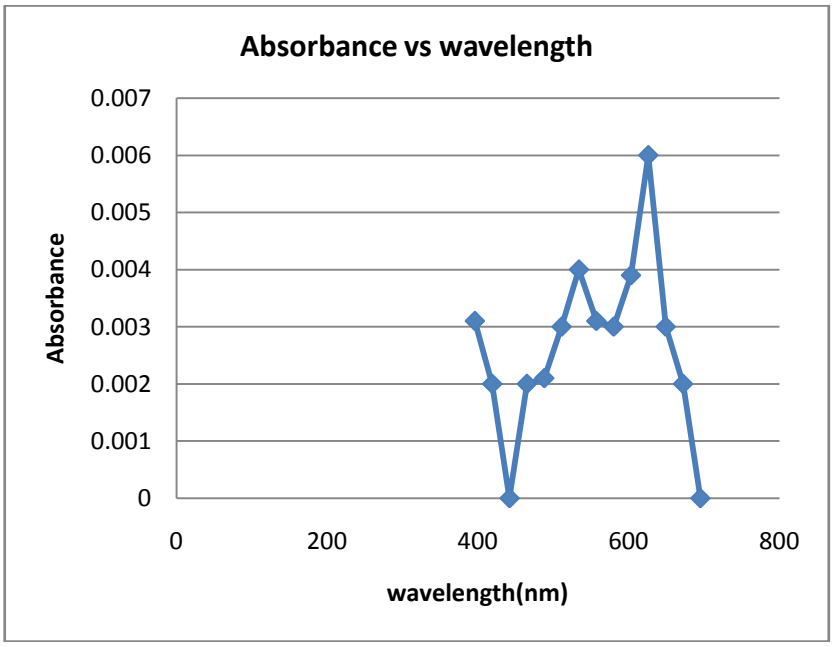
$$= 0.207 \text{ mole/litr}$$

II. OBSERVATION

TABLE 1.1 absorbance and transmittance for different values of wavelength

Wavelength(nm)	Absorbance
396	0.0031
419	0.002
442	0.000
465	0.002
488	0.0021
511	0.003
534	0.004
557	0.0031
580	0.003
603	0.0039
626	0.006
649	0.003
672	0.002
695	0.000

Figure 1.1 absorbance vs. wavelength graph

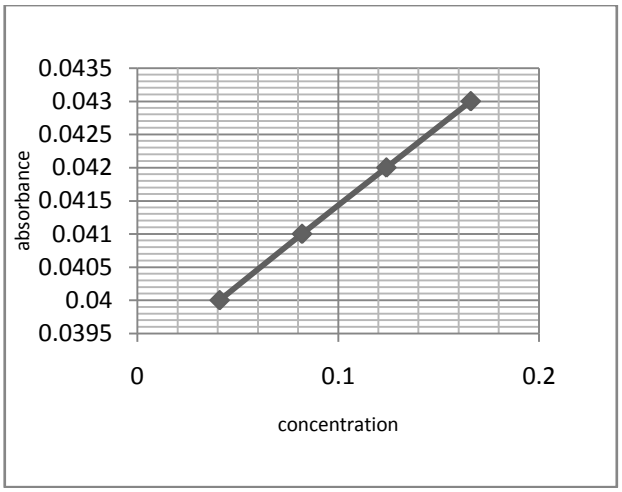


Wavelength fixed =626 nm,
Maximum wavelength= 700 nm
Total solution taken = 5ml

TABLE 1.2 absorbance for different Concentration of the solution

Solution (ml)	Water (ml)	Absorbance	Transmittance (%)	Concentration (final)
1	4	0.040	91.3	0.041
2	3	0.041	91.6	0.082
3	2	0.042	91.8	0.124
4	1	0.043	92.0	0.166

Figure 1.2 absorbance vs concentration graph



III. Results

Maximum Absorbance = 0.006 at wavelength 626 nm (Table 1.1 & figure 1.1) we get two maxima one at 534 nm(blue) for which absorbance is 0.004 and other one at 626 nm(red) for which absorbance is 0.006 and combination of red and blue gives purple color so average absorbance will be $\frac{0.004+0.006}{2} = 0.005$.

Figure 1.2 is the graphical representation of Potassium chromate. This graph shows that Absorbance increases linearly with concentration for a fixed wavelength 626

IV. Conclusion

Ultraviolet-visible spectroscopy is a simple and cost effective procedure for determining the concentration of absorbing varieties to the pure compounds, and used with the appropriate standard curve. A standard curve relating absorbing species to concentration can be developed for any compound, and used to determine the concentration of samples containing the same compound.

The analysis at a wavelength with maximum absorption should be done, and located in relatively flat region of the spectra so that absorbance will be high and constant in a narrow range around the chosen wavelength

References

[1]. Skoog, Douglas A.; Holler, F. James; Crouch, Stanley R. (2007). Principles of Instrumental Analysis (6th ed.). Belmont, CA: Thomson Brooks/Cole. pp. 169–173.
[2]. Metha, Akul (14 May 2012). "Limitations and Deviations of Beer-Lambert Law". PharmaXChange.info.
[3]. Sooväli, L.; Rõõm, E.-I.; Kütt, A.; et al. (2006). "Uncertainty sources in Ultra-voilet-Visible spectrophotometric measurement". Accreditation and Quality Assurance. 11: 246–255
[4]. Willard-Hobart H, Merritt jr Lynne L, Dean John A(1974) Instrument**al** Methods of Analysis.(5th edn),Von Nostrand,University of Michigan.
[5]. Chatwal GR, Anand S Instrumental method of Chemical Analysis (5th edn), Himalaya Publishing House, New Delhi (2002).
[6]. Allen, D., Cooksey, C., & Tsai, B. (2010, October 5). Spectrophotometry. Retrieved
[7]. Schwedt, Georg. (1997). The Essential Guide to Analytical Chemistry. (Brooks Haderlie, trans.). Chichester, NY: Wiley (1943). pp. 16-17