

INTERSHIP REPORT



A report submitted in partial fulfillment of the requirement for the award of degree of

BACHELOR OF SCIENCE

IN

CHEMISTRY

BY

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HIYOSHI india

Ecological Services Pvt. Ltd.

Certificate of Training

This is to certify that

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Successfully completed the "Internship" in the field of Water

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From 11th to 26th September 2023.



Dr. M. MAYILSAMY
Director

ACKNOWLEDGEMENT:

I want to thank my advisers and everyone at the company for their patience and assistance during my on-site training. Thanks to their guidance, I was able to develop my industrial skills and learn about Waste water treatment by uv-spectroscopy analysis these skills will help me to expand my resume and advance my career.

ABOUT COMPANY:

Hiyoshi India Ecological Services Pvt. Ltd. was a result of the 25 years of interactive relationship between Hiyoshi and India through

Talk your way to Japan speech contest, conducted since 1998 to increase environmental awareness among school students in India

Hiyoshi Environmental Awards established in the year 2007 for recognising and felicitating the environmental warriors in India

Hiyoshi University Internship Program since 2007 for students to enhance their career and inspire them to work for the Environment.

ABK AOTS intern training since 1995 to increase environmental awareness among future leaders in the country

Hiyoshi India Ecological Services Private Limited a 100% subsidiary company of Hiyoshi Corporation, Japan was established in the year 2011.

To provide Hiyoshi's 70 years of acquired knowledge in the field of drinking water analysis, wastewater analysis, O&M of STP, solid waste etc. in Chennai.

UV SPECTROSCOPY ANALYSIS

INTRODUCTION

- ❖ UV spectroscopy is a technique that measures how much light a chemical substance absorbs. It's also known as UV-Vis spectroscopy or spectrophotometry.
- ❖ In UV spectroscopy, a molecule absorbs light in the ultraviolet region (200-400 nm). This causes electrons to move from a ground state to a higher energy state. The amount of light absorbed by the sample is correlated with the concentration of the solute

- ❖ Ultraviolet visible (UV-Vis) spectrophotometers use a light source to illuminate a sample with light across the UV to the visible wavelength range (typically 190 to 900 nm).

PRINCIPLE

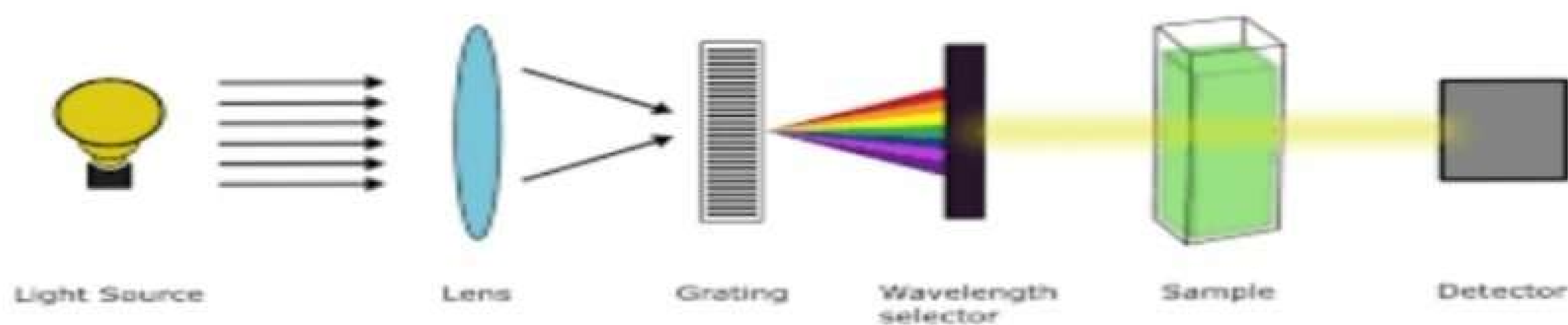
- ❖ It works on the principle of Beer Lambert's law.
- ❖ The Beer-Lambert law is the principle behind UV spectroscopy. This law states that the absorbance of a solution is directly proportional to the concentration of the absorbing species in the solution and the path length. The greater the number of absorbing molecules, the greater the extent of absorption of the radiation.
- ❖ Spectrophotometry is a procedure for determining how much light is reflected by a chemical material by measuring the strength of light as a light beam travels through the sample solution. The wavelength range is from 200nm to 800nm.

Theory

- ❖ energy absorbed in the UV –visible region produces changes in the electronic energy of the resulting from transitions of valence electrons in the molecules.
- ❖ Three distinct types of electrons are involved in organic molecules. They are as follows
 - σ electron,
 - π electron
 - n electron.



INSTRUMENTATION



1) Light Source

Light sources that lie in the ultraviolet and visible region are used as UV-visible spectrometer sources.

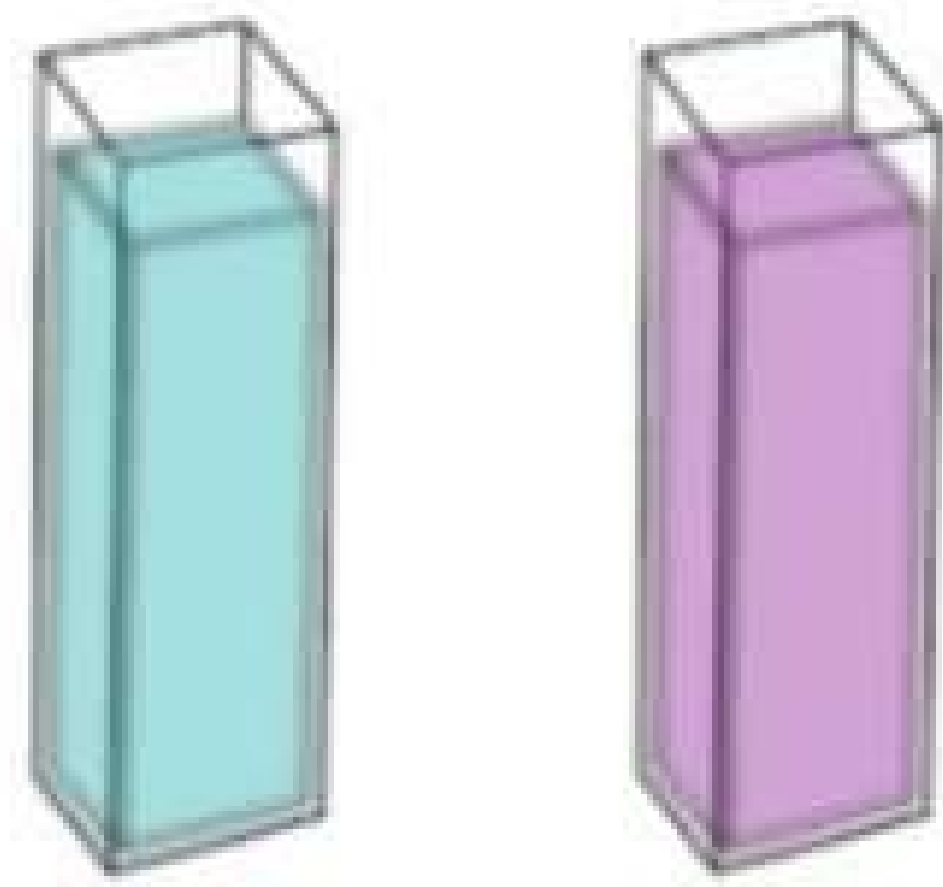
- ✓ Hydrogen & deuterium lamps range 160-380nm
- ✓ Xenon arc lamps range 250-600nm
- ✓ Tungsten halogen lamps range 240-2500nm

2) Wavelength selector

- ❖ UV-Vis spectroscopy requires a single wavelength for proper functioning whereas the ideal output of a single wavelength is not possible. This is so because no real wavelength selector is ideal. Although a single wavelength is not possible, a band of radiation could be used. So an instrument with narrow bandwidth would be better.
- ❖ Types of the wavelength selectors
 - ✓ Filters
 - ✓ Monochromators

3. Sample container/cells or cuvettes

- ❖ Sample containers or cuvettes may be made up of
 - ✓ Quartz
 - ✓ Borosilicate
 - ✓ Plastic
- ❖ Only quartz is transparent in both UV & visible regions (200-700nm range).
- ❖ Glass & plastic are suitable for the visible region only.



sample containers or cuvettes

4) Detectors

- ❖ Detectors are devices that indicate the existence of some physical phenomenon. Some examples of simple detectors are
 - ✓ Transducers
 - ✓ Photodetectors
 - ✓ Photographic films
 - ✓ Mercury level in thermometers

ADVANTAGES

- ❖ The method is non-destructive so that the sample can be reused.
- ❖ Measurement can be done in a short span of time, helping easy integration into experiments.
- ❖ Data analysis is simple and requires less processing.

Disadvantages

- ❖ Real instruments are not always perfect; hence stray light may interfere with the measurements.
- ❖ Scattering of light due to bubbles or undissolved solid particles in the sample solution causes measurement error.

Application

- ❖ Identification of molecules in a sample.
- ❖ Determining the concentration of a compound in a sample.
- ❖ Determine the purity or concentration of biological samples containing DNA or RNA.
- ❖ It finds application in characterizing the rate of a chemical reaction.

DETERMINATION OF AMMONICAL NITROGEN IN WASTEWATER BY UV SPECTROSCOPY

Principal

- ❖ A method for conditioning a sample of water or wastewater for detection of ammonia by a UV spectrometer, comprising: raising the pH of the sample to 11 or 12; and mixing a quantity of a solution of sodium hypochlorite with the sample in an amount sufficient to react with all of the ammonia present to form chloramines.

Reagent required

- ❖ Ammonical nitrogen
- ❖ Nessler's reagent: Hg+KI in basic medium. NaOH is needed to be added
- ❖ Rochelle's reagent

PROCEDURE

- ❖ Make 100ml standard solution with blank, 0.5ppm, 1.0ppm, 1.5ppm, 2.0ppm, 2.5ppm.
- ❖ Add few drops of Rochelle's reagent for removing interference of other ions.
- ❖ After that add 1ml of Nessler's reagent and mix well.
- ❖ After that rest at for 10 mins at room temperature.
- ❖ Measure the absorbance at 410nm

CHEMICAL OXYGEN DEMAND(COD)

Chemical oxygen demand (COD) is a measure of the amount of oxygen required to oxidize organic matter in a water sample. The principle behind COD is that a strong oxidizing agent can oxidize almost any organic compound to carbon dioxide under acidic conditions. COD is often used to monitor water treatment plant efficiency

Principle

Potassium dichromate is added to the sample which will digest or oxidize all the organic or other industrial wastes with mercuric sulphate and silver sulphate in the presence of sulphuric acid. The left amount of the potassium dichromate will be estimated against titration by ferrous ammonium sulphate.

PROCEDURE

- ❖ 20 ml of aliquote of the sample diluted to 20 ml is taken in COD tube.
- ❖ In that add 2ml of mercuric sulphate is added.
- ❖ Then add 10ml of potassium dichromate.
- ❖ Then through the sides of COD tube of sulphuric acid is added.
- ❖ Sample is digested for 2 hours at 150C
- ❖ COOLED IN THE DESICATOR FOR 15 mins.
- ❖ Titrate against FAS .
- ❖ NOTE THE TITRATE VALUE.

FORMULA

$$\text{COD (mg/l)} = (a-b)(N) \times 8,000 / \text{sample size (ml)}$$
 Where: a = ml $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$ used for blank. b = ml $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$ used for sample. N = normality of FAS titrant.

CONCLUSION

UV-visible spectroscopy is a valid, simple and cost effective method for determining the concentration of absorbing species if applied to pure compounds, and used with the appropriate standard curve.