

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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Date: 01/06/2025

Ref: SUN/2023/05

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms.SNEHA.S, Reg. No. 41030019, student of BSc Chemistry from "Sathyabama Institute of Science and Technology, Chennai", has undergone industrial with our organisation in the Quality Control Department from 25.05.2023 to 10.06.2023, for the period of 15 days. During her training period we found her sincere and Hardworking.

Free-Form Gold Engineering, INC.

[Signature]
 SA. GURUKUMAR
 Proprietor

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 XRF spectroscopy analysis these skills will help me to expand my resume and advance my career.

ABOUT COMPANY:

Established in the year 25th September 2012, we at sun gold engineering are considered in the market to be amongst the leading manufacturer and using the products are Iron pyrite Lumps, Iron pyrites, Cable tray, Iron ore made the steel in Chennai. Manufacturing of guidelines, Utilizing the finest raw materials. This ensure the product standard of quality.

The state- of -the- art infrastructural facility at sun gold engineering undergoes regular up-gradation, in order to maximize our presence in the market and our production capacity. For reason of attaining effective management of the firm's operations, the facility has been parted into several highly operational units. The facility placed with all the necessary machinery and equipment help us in the attainment of several of the firms predefined goals and targets.

XRF SPECTROSCOPY ANALYSIS

INTRODUCTION:

- ❖ X- ray fluorescence (XRF) spectrometry is an elemental analysis technique with broad application in science an industry.
- ❖ XRF is routinely used for the simultaneous determination of elemental composition and film thickness.
- ❖ Modern XRF instruments are capable of analyzing solid, liquid, and thin-film samples for both major and trace (ppm-level) components.
- ❖ The analysis is rapid and usually sample preparation is minimal or not required at all.



PRINCIPLE:

- ❖ XRF is based on the principle that individual atoms, when excited by an external energy source, emit X-ray photons of a characteristic energy or wavelength. By counting the number of photons of each energy emitted from a sample, the elements present may be identified and quantitated.

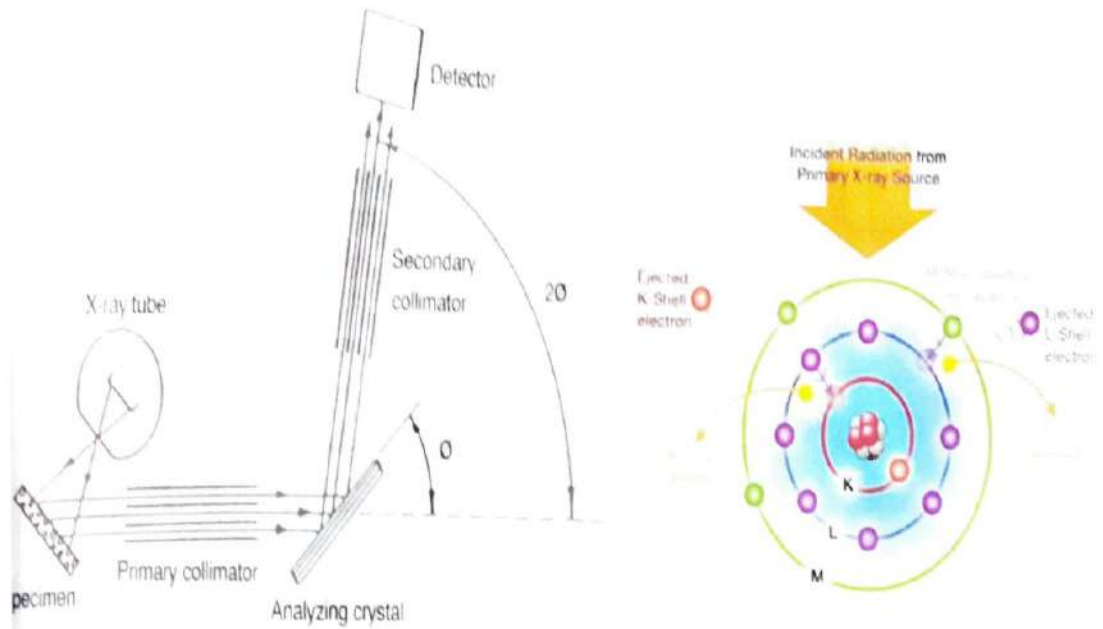
THEORY:

- ❖ When an electron beam of high energy strikes a material, one of the interaction is the emission of photons which have a broad continuum of energies. This radiation, called "braking radiation", is the result of the deceleration of the electrons inside the material. The bremsstrahlung continuum is illustrated as a function of electron acceleration voltages for a molybdenum target.

INSTRUMENTATION:

- Most of the XRF instruments in use today fall into two categories: energy Dispersive (ED) and wavelength-dispersive (WD) spectrometers.
- Within these two categories is a tremendous variety of differing configurations, X-ray sources and optics, and detector technologies.
- **WAVELENGTH-DISPERSIVE (WD):** The instrument operates based on the principle of Bragg diffraction of a collimated X-ray beam, in this case the beam emanating from the sample. A detector is angularly scanned relative to the analyzing crystal, registering the spectrum.

- **ENERGY DISPERSIVE (ED):** The entire polychromatic spectrum from the sample is incident upon a detector that is capable of registering the energy of each photon that strikes it. The detector electronics and data system then build the X-ray spectrum as a histogram, with number of counts versus energy.



ADVANTAGES OF XRF:

- ❖ XRF is a versatile, rapid technique.
- ❖ It is a non-destructive method of chemical analysis.
- ❖ Applicable to a wide variety of samples from powders to liquids.

DISADVANTAGES OF XRF:

- ❖ Disadvantages include fairly high limits of detection (LODs) when compared to other methods.
- ❖ Possibility of matrix effects, although these can usually be accounted for using software-based correction procedures.
- ❖ PXRF instruments are capable of producing results comparable in many ways to the lab-based XRF at a fraction of the cost.

STRENGTH & LIMITATION OF XRF:

XRF is particularly well-suited for investigations that involve:

- Bulk chemical analysis of major elements.
(Si, Ti, Fe, Mn, Ca, Na, K, P) in rock and sediment.
- Bulk chemical analysis of trace elements.
(1 greater ppm: Ba, Ce, Co, Cr, Cu, Ga, La, Nb, Ni, Rb, Sc, Sr, Rh, Zr, Zn)

BENEFITS OF XRF ANALYSIS:

- ❖ Minimal or no sample preparation.
- ❖ Non- destructive analysis.
- ❖ Na 11 to U 92 analysis, ppm to high percentage concentration range.
- ❖ No wet chemistry --- No acids, no reagents.
- ❖ Rapid analysis ---- result in minutes.
- ❖ For routine quality control analysis instrument can be used by anyone.

APPLICATION OF XRF:

X-Ray Fluorescence used in many different disciplines.

❖ GEOLOGY:

- Major, Precious, Trace elemental analysis.
- Characterization of Rocks, Ores, and Soils.

❖ ENVIROMENTAL REMEDIATION:

- Pb in paint.
- Heavy metals in soil.

❖ RECYCLING:

- Alloy identification.
- Waste processing.

❖ MISCELLANEOUS:

- Art and archeology.
- Industrial hygiene.
- Forensics.



Sample Name
Method
Sample Folder
Sample Type
Sample Status
Operator

A1 (2)
IRON ORE -test(1)
December 2021
Pressed Tablet
A X A A X X X X
Admin User

Dilution Material
Sample Mass
Dilution Mass
Dilution Factor
Measurement Date
Evaluation Date

HWC
5.0000
1.0000
0.8333
12/17/2021 1:07 PM
12/17/2021 1:07 PM

Results - A1 (2)

The error is the statistical error with 1 sigma confidence interval

Element	Concentration	Abs. Error
11 Na ₂ O Sodiumoxide	0.1755 %	0.0013
12 MgO Magnesiumoxide	< 0.0017 %	-
13 Al ₂ O ₃ Aluminiumoxide	0.3028 %	0.0023
14 Al Aluminium	0.1602 %	0.0013
15 SiO ₂ Siliconoxide	0.4843 %	0.0022
16 Si Silicon	0.2264 %	0.0010
17 P ₂ O ₅ Phosphorusoxide	1.362 %	0.002
18 P Phosphorus	0.5940 %	0.0009
19 S Sulfur	1.120 %	0.007
20 Cl Chlorine	0.4487 %	0.0007
21 K ₂ O Potassiumoxide	0.1212 %	0.0001
22 CaO Calciumoxide	0.84173 %	0.00040
23 Ti Titanium	0.0069 %	0.0013
24 TiO ₂ Titaniumoxide	0.01306 %	0.00023
25 V ₂ O ₅ Vanadiumoxide	0.02303 %	0.00039
26 Cr ₂ O ₃ Chromiumoxide	-	-
27 Mn Manganese	0.01152 %	-
28 MnO Manganeseoxide	< 0.00002 %	0.00005
29 Fe ₂ O ₃ Ironoxide	< 0.00001 %	-
30 Fe Iron	8.823 %	0.007
31 Co ₃ O ₄ Co ₃ O ₄	6.171 %	0.005
32 NiO NiO	-	-
33 CuO CuO	-	-
34 ZnO Zincoxide	-	-
35 Al ₂ O ₃ Al ₂ O ₃	-	-
36 Ba Barium	-	-
37 BaSO ₄ Barium Sulphate	-	-
38 La ₂ O ₃ La ₂ O ₃	-	-
39 CeO ₂ CeO ₂	-	-
40 PbO PbO	-	-

AMETEK
MATERIALS ANALYSIS DIVISION

CONCLUSION:

Since, X-ray fluorescence analysis can analyze a sample non-destructively and quickly, it can be applied to a wide range of uses such as manufacturing and quality control.