9.8 X-Ray Fluorescence

9.8.1 Introduction

The X-Ray Fluorescence (XRF) technique permits the analyst to obtain elemental information about the sample.

9.8.2 Safety Considerations

The X-ray detector uses liquid nitrogen. Care must be used to protect the eyes and skin while working with liquid nitrogen.

The X-ray source produces X-ray radiation. Care must be used that appropriate shields are in place when X-rays are being generated.

9.8.3 Preparations

- Carbon tape, discs, or adhesives for mounting sample
- X-ray transparent film (e.g., Kapton)
- Scalpel
- Tweezers

9.8.4 Instrumentation

- X-Ray Fluorescence Spectrometer (MSP Grand Rapids Forensic Laboratory).
- Stereomicroscope

9.8.5 Procedure or Analysis

9.8.5.1

Sample each layer for comparison separately, if possible.

9.8.5.2

Mount chips onto mounting medium.

9.8.5.3

If necessary, make a drawing of the surface of the stub in order facilitate locating the paint chips in the XRF. Make a copy to retain in the case record.

9.8.5.4

Package to protect the samples during transport and sample handling.

9.8.5.5

If necessary, transport samples and drawing via U.S. Mail, UPS or carrier to the Trace Evidence unit of the Michigan State Police Grand Rapids Laboratory.

9.8.5.6

Guidelines for XRF Qualitative Analysis Interpretation:

9.8.5.6.1

Terminology:

Pile-Up Peaks: Occur at double the Kα of an element or at the sum of two elements' Kα. They are also known as sum peaks. Decreasing current (μA) will not decrease a sum peak's height.

Escape Peaks: Occur with elements having an atomic number greater than silicon, due to radiation from silicon in the Solid State Detector. They occur at 1.74 keV below the element peak. Like pile-up peaks, they do not change with current (μA).

9.8.5.6.2

General Guidelines:

Only peaks which are statistically significant should be considered for identification of an element. An element may be labeled when its signal-to-noise ratio is at least 3.

Replicates may be necessary to characterize the heterogeneity of the samples.

9.8.6 References

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