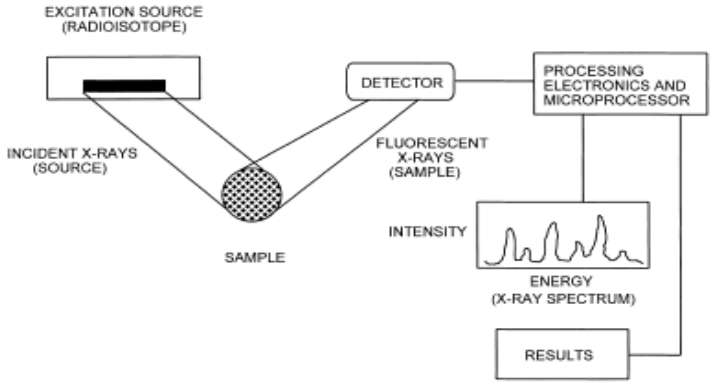
Field-Portable X-ray Fluorescence

Introduction

Field-portable X-ray fluorescence (FPXRF) is an analytical technique using a small, hand-held portable instrument for rapid, low-cost analysis of inorganic contaminants (aka metals) in environmental samples.

Its operating principle entails the emission of "secondary", fluorescent x-rays from a material (soil in this case) that has been excited with high energy x-rays or gamma rays from the instrument. The secondary fluorescent beam that escapes the soil is captured by a detector/analyzer that can measure the intensity and characteristics of the beam. The detector/analyzer (aka spectrometer) then uses this information to identify metals in the soil sample and their corresponding concentrations. Below is a figure denoting the instrument components:



In the past, the FPXRF was only used for screening purposes but recent advances in technology now permit the method to yield results comparable with laboratory methods. Traditional laboratory methods typically cost much more than FPXRF and take significant time to complete. FPXRF instruments are factory calibrated for rapid, accurate analysis of heavy metals in soil, and provide data of know quality.

Analysis and Quality Assurance (QA) / Quality Control (QC)

When a soil sample is received, it is prepared prior to FPXRF analysis. The sample is dried, sieved, placed in a XRF sample cup, and analyzed. QA/QC procedures are integrated into the FPXRF analysis protocol to provide data of known quality. As a confirmatory quality control step, a percentage of the samples collected are sent to a laboratory to establish a statistical relationship between the XRF results and laboratory results.

Typical Reporting Limits (RLs) in parts per million (ppm) for selected elements are listed below for FPXRF analyses of prepared soil samples. These values are low enough for the results to provide useful information for urban gardeners.

Element	Symbol	RL (ppm)[a]
Lead	Pb	40
Arsenic	As	30
Cadmium	Cd	80

[a] 120 seconds measurement time; the RL may vary depending on the sample matrix.