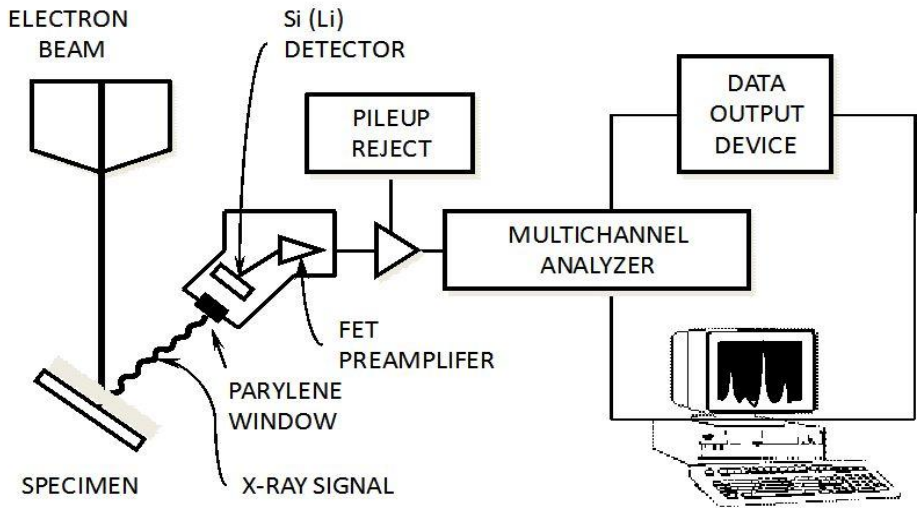
Gossman Forensics
A Division of ChemRight Laboratories, Inc.
103 South Main Street
Maquoketa, IA 52060
Phone: 563.652.2822
Email: dgossman@gossmanforensics.com

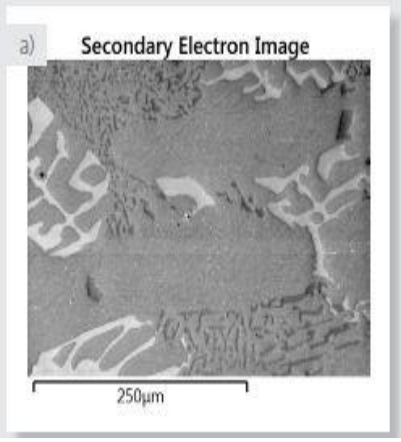
How Does Scanning Electron Microscope/Energy Dispersive X-ray (SEM/EDX) Work?

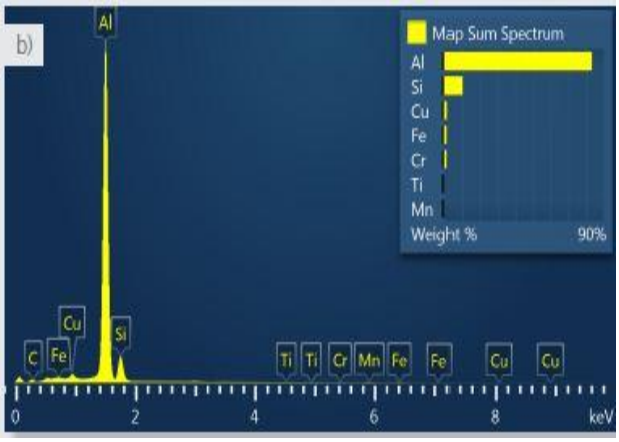
Scanning Electron Microscopy (SEM) provides a high resolution, high magnification image of a sample material by emitting a finely focused beam of electrons onto a sample. This beam interacts with the molecular composition of the sample. These interactions produce a series of measurable electron energies that are analyzed by the the scanning electron microscope to create a three dimensional image.

The beam of electrons emitted on the sample also produces x-rays. The energy dispersive x-ray (EDX) instrument collects the x-rays and converts them into useful information. Each element has a set of characteristic x-ray lines. The energy dispersive x-ray technique is utilized to identify the element and measure the composition of the sample material. The output from the EDX analysis is a spectrum. The EDX spectrum is a plot of how frequently an x-ray is received for each energy level. An EDX spectrum normally displays peaks corresponding to the energy levels (when the most x-rays were received). These peaks are generally unique to an element. Higher peaks in the spectrum indicates higher concentrations in that element. Overlapping peaks from mixtures are deconvolved using special computer software.



Energy dispersive x-ray systems are often attachments to scanning electron microscopy instruments. Typically scanning electron microscopy provides the visual analysis and energy dispersive x-ray provides the elemental analysis. Scanning electron microscopy with energy dispersive x-ray is a powerful tool to classify and discriminate materials because they can simultaneously examine the morphology and the elemental composition of objects. Some of the typical applications of SEM/EDX are identification and classification of different material structures, examination of surface morphology, particle contamination identification, structural analysis, forensic examinations, identification of corrosion and oxidation problems, product and process failure.





Process diagram for SEM/EDX (above) and SEM/EDX sample results output (below)