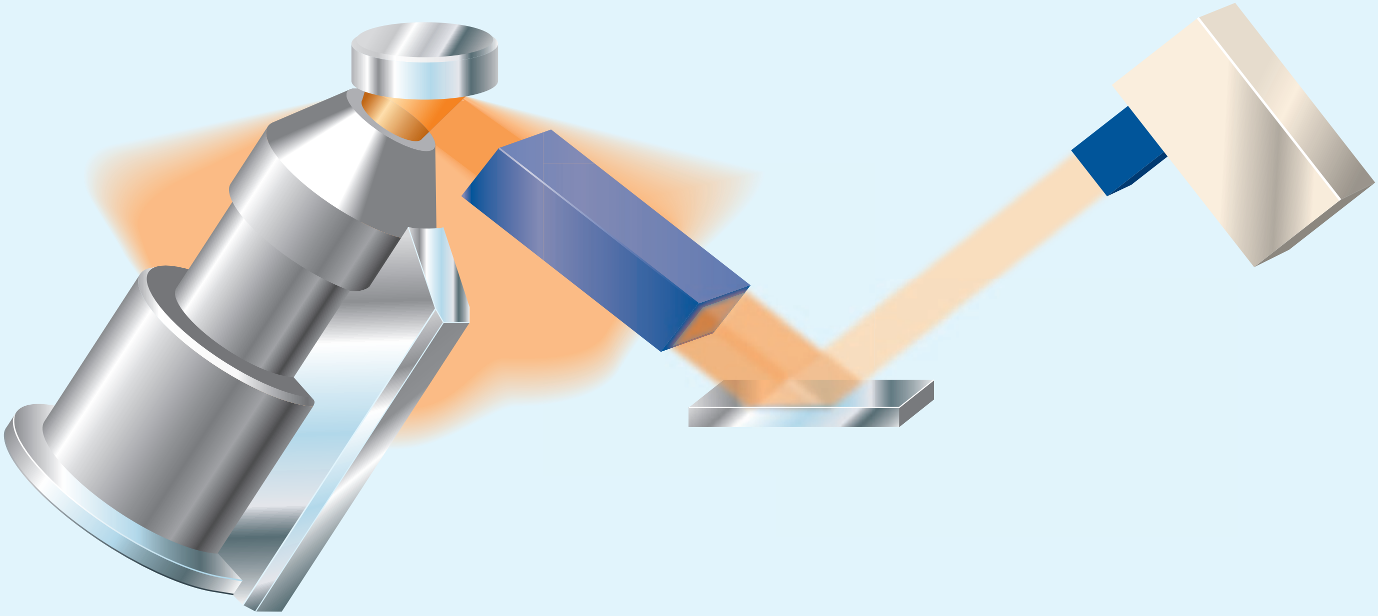

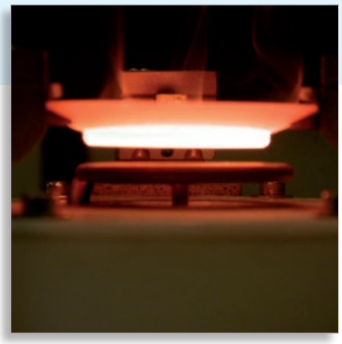

X- Ray Fluorescence Spectroscopy (XRF)

Fast and precise inorganic solid analysis

- fast
- quantitative and qualitative
- elemental analysis from F to U
- trace analysis to ppm levels
- bulk and thin layer

X-ray fluorescence spectroscopy (XRF) is a well-established analytical technique for the determination of the elemental composition of solid materials in bulk or thin film form. Its speed, reliability and accuracy make it extremely useful for process development/control and process optimization.

In XRF a sample is irradiated by an X-ray beam, which results in ejection of inner shell electrons from the sample atoms. Outer shell electrons take their place and the difference in energy level results in the emission of X-rays (secondary radiation). The wavelength of these X-rays is characteristic for each element present, and the intensity of the emission is related to the concentrations of the elements.

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The basics of a wavelength dispersive spectrometer are shown in the graphic on the front page. After irradiation of a sample, the emitted X-rays are collimated and subsequently separated according to wavelength by crystal diffraction (Bragg's law). The intensity of the radiation is detected by a scintillation counter or a gas-filled flow counter. Detection of different wavelengths is possible by combining various collimators with crystals of different lattice spacings. In this way it is possible to look at a large range of elements. Generally, quantification in bulk materials is possible using known reference materials. In thin layer applications, a fundamental parameter model with a minimal set of reference materials is required.

Applications

- phase-change optical recording films: GeSbTe, AgInSbTe layers
- IC technology: TiN layers on Si substrates
- glass for display and lighting applications
- raw materials
- minerals, refractories and ceramics
- metals, alloys and composites
- fast semi-quantitative survey analysis
- recycling glass

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Some typical applications

1. Quality inspection of metal products

2. Composition of recycling glass

3. Incoming inspection of raw materials

4. Quality metal parts

5. Process control of lighting glass

6. Development of phase-change layers

Characteristics

Sample type

- solid (powder, glass, metal, composite) in bulk or thin film form
- flat and homogeneous samples can be measured directly
- otherwise pressed pellets, glasses or fused/remelted beads are prepared

Detection limits

- element- and sample-dependent
- ppm level for bulk applications
- 10^{13} atoms/cm^2 for thin films

Precision

- semi-quantitative to <1%

Accuracy

- better than 1% using reference material

Destructive/non-destructive

- dependent on sample pre-treatment

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