

X-RAY DIFFRACTION

X-ray Diffraction is a method for examining the fundamental structural properties of crystalline materials. When irradiated with a monochromatic beam of x-rays, crystalline materials diffract the x-rays at angles determined by the atomic spacing and arrangement in the lattice planes. No two compounds have the exact same crystal structures. Their diffraction patterns can serve as "fingerprints" used to identify:

- 1) Crystalline phases
- 2) Some non-crystalline (amorphous) phases
- 3) Characteristic properties or performance criterion.

Sample types include minerals, organic and inorganic chemicals, refractories, ceramics, pharmaceuticals, and metals. The sample can be a powder, solid, film, or "wet" filter cake. Turnaround time varies with the number of samples submitted and other priority samples in the queue.

Analysis types include:

- 1) Qualitative identification (phases are identified as major, minor or trace)
- 2) Semi-quantitative estimates (phases are identified and a range of the percent present is estimated)
- 3) Quantitative (phases are quantified using matrix specific standards).

Qualitative Uses

Phase Identification
Polymorph Discriminations
Phase Transformations
Corrosion Products
Alloy Solid Solutions
Reaction Products
Un-reacted Raw Materials

Quantitative Uses

Government Regulated Species
Amounts of Polymorphs
Amounts of Separate Phases
Crystallite Size
Crystallinity
Unit Cell Parameters

Analytical Service	Matrix	Range	Precision
Quantitative alpha -quartz	Talc, Limestone,	0.03-1%	RSD 20%
	Dolomite	1-5%	RSD 10%
Quantitative tremolite	Talc, Limestone,	0.2-1 %	RSD 20%
	Dolomite	1-5%	RSD 20%
Chrysotile asbestos	Talc, Limestone, Dolomite, Dust, Insulation, Floor Tile	Consult	RSD 20%
Determination of aragonite/calcite	PCC	0.5-100%	RSD 2%

Thermal XRD monitors the change in phases with respect to the change in temperature. The analysis temperature ranges from ambient to 1575C.

Specialized parallel beam optics permit surface analysis of solid pieces.

Sample size

Routine qualitative analysis 10-20 g, (1 g minimum on a dry weight basis). Please consult if sample size is limited.

Turnaround

Typical 2 weeks, 4 hour minimum when no sample preparation required

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