2.1 CLASSIFICATION OF EXPERIMENTAL TECHNIQUES

Table 2.1.1. *Summary of main experimental techniques for structure analysis*

Name of technique	Beam		Sample	Usual detectors
	Usual type	Spectrum		
(*A*) *Single crystal*				
Laue	X-ray or neutron	Polychromatic	Stationary single crystal	Film; image plate or storage phosphor; electronic area detector (*e.g.* CCD); for neutron case, detector sensitive to time-of-flight
Still	X-ray or neutron or electron	Monochromatic	Stationary single crystal	Film; image plate or storage phosphor; electronic area detector (*e.g.* MWPC, TV, CCD)
Rotation/oscillation	X-ray	Monochromatic	Single crystal rotating about a single axis (typical angular range per exposure 5–15° for small molecule; 1–2° for protein; 0.25–0.5° for virus)	Film; image plate or storage phosphor; electronic area detector (*e.g.* MWPC, TV, CCD)
Weissenberg	X-ray	Monochromatic	Single crystal rotating about a single axis (angular range $\geq 15^\circ$), coupled with detector translation	Film; image plate or storage phosphor
Precession	X-ray	Monochromatic	Single crystal (the normal to a reciprocal-lattice plane precesses about X-ray beam)	Flat film moving behind a screen coupled with crysal so as to be held parallel to a reciprocal-lattice plane
Diffractometry	X-ray or neutron	Monochromatic	Single crystal rotated over a small angular range	Single counter, linear detector or area detector
(*B*) *Polycrystalline powders*				
Monochromatic powder method	X-ray or neutron or electron	Monochromatic	Powder sample rotated to increase range of orientations presented to beam	Film or image plate; counter; 1D position-sensitive detector (linear or curved)
Energy-dispersive powder method	X-ray or neutron	Polychromatic	Powder sample	Energy-dispersive counter (for neutron case, detector sensitive to time-of-flight)
(*C*) *Fibres, solutions, surfaces, and membranes*				
Fibre method	X-ray or neutron	Monochromatic	Single fibre or a bundle of fibres; preferred orientation in a sample	Film or image plate; electronic area detector (*e.g.* MWPC or TV); records high-angle or low-angle diffraction data
Solution or 'small-angle method'	X-ray or neutron	Monochromatic	Dilute solutions of particles; crystalline defects	Counter or MWPC
Surface diffraction	Electron or X-ray	Monochromatic	Atoms deposited or adsorbed onto a substrate	Phosphor or counter
Membranes	Electron or X-ray	Monochromatic	Naturally occurring 2D ordered membrane protein	Film or image plate; CCD

Notes

(1) Monochromatic. Typical value of spectral spread, $\delta\lambda/\lambda$, on a conventional X-ray source; $K\alpha_1 - K\alpha_2$ line separation $\sim 2.5 \times 10^{-3}$, $K\alpha_1$ line width $\sim 10^{-4}$. On a synchrotron source a variable quantity dependent on type of monochromator; typical values $\sim 10^{-3}$ or $\sim 10^{-4}$ for the two common monochromator types (see Figs. 2.2.7.2 and 2.2.7.3, respectively).

(2) CCD = charge-coupled device; MWPC = multiwire proportional chamber detector; TV = television detector.

(3) Image plate is a trade name of Fuji. Storage phosphor is a trade name of Kodak.

(4) EXAFS can be performed on all types of sample whether crystalline or noncrystalline. It uses an X-ray beam that is tuned around an absorption edge and the transmitted intensity or the fluorescence emission is measured.

references