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FUNDAMENTALS OF ABSOLUTE STRUCTURE DETERMINATION

Simon Parsons, The University of Edinburgh; e-mail: s.parsons@ed.ac.uk

Friedel's Law states that the X-ray diffraction pattern of a crystal is centrosymmetric, even when the crystal structure itself lacks inversion symmetry. If this Law held exactly, absolute structures could not be determined by X-ray diffraction, because the diffraction patterns of a structure and its inverted counterpart would be indistinguishable. In practice, absolute configurations can be distinguished because of anomalous scattering—also called anomalous dispersion or resonant scattering—which introduces small deviations from Friedel's law. This effect is closely linked to X-ray absorption, a spectroscopic process that alters diffracted intensities by slightly modifying the amplitude and phase of X-rays scattered by atoms. The first lecture will describe the physical origin of anomalous dispersion, explain how it modifies the atomic scattering factor, and show how these changes lead to measurable departures from Friedel's Law.