Lecture 6 — X-Rays

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- Target Materials and Wavelengths

    - Laboratory X-ray diffraction equipment relies on the use of an X-ray tube

- Bragg's Law

    - Refracted waves may be defined by:

$$x + y = n\lambda$$

$$d\sin(\theta) = x = y$$

$$2d\sin(\theta) = n\lambda$$

    * Where n is the "order" of the wave ($n = 1$ is the first harmonic), x and y are the distance between the angle of incidence and the original or refracted waves, and λ is the wavelength
    * Monochromators are used to limit the X-ray beam to be monochromatic in most cases

- Determining Inter-planar Spacing

    - Cubic:

$$d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$$

    - Hexagonal:

$$d_{hkl} = \frac{a}{\frac{4}{3}(h^2 + k^2 + hk) + \frac{a^2 l^2}{c^2}}$$