Density of Unit Cell

Thus

$$n \times M = V \times \rho$$

$$\rho = \frac{n \times M}{V} = \frac{n \times M}{V \times 6.023 \times 10^{23}}$$

$$\boxed{\rho = \frac{n \times M}{V \times N}}$$

where $N = 6.023 \times 10^{23}$ is the Avogadro's number.

The volume of unit cell for different lattice is given below: Cubic v = a^3; Hexagonal = $abc \sin 60°$

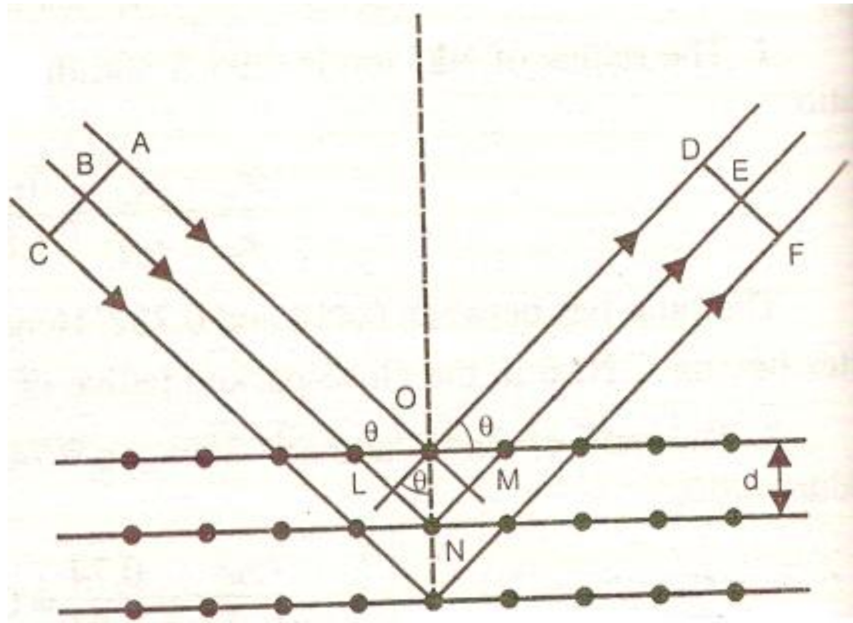
Orthorhombic v = abc; Rhombohedral =

$$\frac{1}{2} a^3 \sin^2 \alpha / \cos \alpha / 2$$

The Bragg's equation.

W.H. Bragg pointed out that scattering of X-rays by crystal could be considered as reflection from successive planes of atoms in the crystals. However, unlike reflection ordinary light, the reflection of X-rays can take place only at certain angles which are determined by the wavelength of the X-rays and the distance between the planes in the crystal. The fundamental equation which gives a simple relation between the waveleng of the X-rays the interplanar distance in the crystal and the angle of reflection, is known as the Bragg's equation.

Derivation of the Bragg's equation.



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The horizontal lines represent parallel planes in the crystal structure separated from one another by the distance *d.* Suppose a beam of X-rays falls on the crystal at glancing angle Some θ these rays will be reflected from the upper plane at the same angle while some othe θ will be absorbed and set reflected from the successive layers.

Derivation of the Bragg's equation.

Let the planes *ABC* and *DEF* be drawn perpendicular to the incident and reflected beams. The waves reflected by different layer planes will be in phase with one another only if the differencein the path lengths of the waves reflected from the successive planes is equal to an integral number of wave lengths. Drawing *OL* and *OM* perpendicular to the incident and reflect beams, it will be seen that the difference in the path lengths of the waves reflected from the first two planes is:

$$\delta = LN + NM$$

This should be equal to a whole number multiple of wavelength λ,

$$LN + NH = n\lambda$$

Since the triangles *OLN* and *OMN* are congruent hence *LN* = *NM*

$$2\,LN = n\lambda$$

$$\boxed{2d\sin\theta = n\lambda}$$

Derivation of the Bragg's equation.

This is the Bragg's equation. This gives the condition which must be satisfied for the reflection of *X-rays* from a set of atomic planes. Knowing , *n* θ and *d* λ, e can be calculated.