

## 7.4: Zone axis

A zone axis is a lattice row parallel to the intersection of two (or more) families of lattice planes. It is denoted by  $[u\ v\ w]$ . A zone axis  $[u\ v\ w]$  is parallel to a family of lattice planes of Miller indices  $(hkl)$  if:

$$uh + vk + wl = 0$$

This is the so-called Weiss law.

The indices of the zone axis defined by two lattice planes  $(h_1, k_1, l_1)$ ,  $(h_2, k_2, l_2)$  are given by:

$$\frac{u}{\begin{vmatrix} k_1 & l_1 \\ k_2 & l_2 \end{vmatrix}} = \frac{v}{\begin{vmatrix} l_1 & h_1 \\ l_2 & h_2 \end{vmatrix}} = \frac{w}{\begin{vmatrix} h_1 & k_1 \\ h_2 & k_2 \end{vmatrix}}$$

Conversely, any crystal face can be determined if one knows two zone axes parallel to it. It is the zone law, or *Zonenverbandgesetz*.

Three lattice planes have a common zone axis (*are in zone*) if their Miller indices  $(h_1, k_1, l_1)$ ,  $(h_2, k_2, l_2)$ ,  $(h_3, k_3, l_3)$  satisfy the relation:

  $\begin{vmatrix} h_1 & k_1 & l_1 \\ h_2 & k_2 & l_2 \\ h_3 & k_3 & l_3 \end{vmatrix} = 0$

$$\begin{vmatrix} h_1 & k_1 & l_1 \\ h_2 & k_2 & l_2 \\ h_3 & k_3 & l_3 \end{vmatrix} = 0$$

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