bonds, for a homo-octahedral case, are illustrated in Figs. 9.2.2.10(*a*) and 9.2.2.10(*b*),(*c*), respectively. The two kinds of sheets are represented by the corresponding symbolic figures indicated in Fig. 9.2.2.6. For Fig. 9.2.2.10(*a*): the symmetry of *Tet* is $P(3)1m$, thus $N = 6$; the symmetry of *Oc* is $H(\bar{3})12/m$ and its position relative to *Tet* is such that the symmetry of the pair is $P(3)1m$, thus $F = 6$ and $Z = 1$: this stacking is unambiguous.* But, if the sequence of these two sheets is reversed, $Z = 3$, because $N_{Oc} = 18$ (*h* centring of *Oc*). For Figs. 9.2.2.10(*b*) and (*c*), $Z = 3$. Similar relations can be derived for meso- and hetero-octahedral sheets as well as for the pair (*Tet*; *Tet*) in the talc–pyrophyllite group.

A detailed geometrical analysis shows that the possible positions are always related by vectors $\pm\mathbf{b}/3$. This, together with the trigonal symmetry of the individual sheets, leads to the fact that any superposition structure (§9.2.2.2.5) is trigonal (also rhombohedral) or hexagonal, and the set of diffractions with $k_{\rm ort} \equiv 0 \pmod 3$ has this symmetry too. This is important for the analysis of diffraction patterns.

Some characteristic features of basic types of hydrous phyllosilicates are as follows:

The serpentine–kaolin group: The general structural principle is shown in Fig. 9.2.2.11. The structures belong to category II (§9.2.2.2.7.2). In the homo-octahedral family, there are 12 non-equivalent (16 non-congruent) MDO polytypes (any two polytypes belonging to an enantiomorphous pair are equivalent but not congruent); in the meso-octahedral family, there are 36 non-equivalent (52 non-congruent) MDO polytypes. These sets are identical with the sets of *standard* or *regular* polytypes derived by Bailey (for references see Bailey, 1980) (trioctahedral) and by Zvyagin (1967) (dioctahedral and trioctahedral). The individual polytypes can be ranged into four groups (subfamilies, which are individual OD groupoid families), each with a characteristic superposition structure.

The mica group: The general structural principle is shown in Fig. 9.2.2.12. The structures belong to category IV. There are 6 non-equivalent (8 non-congruent) homo-octahedral MDO polytypes, 14 (22) meso-octahedral, and 36 (60) hetero-octahedral MDO polytypes. The homo-octahedral MDO polytypes are identical with those derived by Smith & Yoder (1956); meso-octahedral MDO polytypes include also those with non-centrosymmetric 2:1 layers (*Tet*; *Oc*; *Tet*); some of these have also been derived by Zvyagin *et al.* (1979). The individual polytypes can be ranged into two groups (subfamilies). For complex polytypes and growth mechanisms, see Baronnet (1975, 1986).

The talc–pyrophyllite group: The general structural principle is shown in Fig. 9.2.2.13. The structures belong to category I. There are 10 (12) MDO polytypes in the talc family (homo-octahedral) and 22 (30) MDO polytypes in the pyrophyllite family (meso-octahedral); some of these have been derived also by Zvyagin *et al.* (1979). The structures can be ranged into two

* If the symmetry of *Tet* is $P(6)mm$ (in the Pauling model), $Z = 2$. This case is common in the literature. However, with the trigonal symmetry of *Tet*, these two possibilities would correspond to Franzini (1969) types *A* and *B*, which are not geometrically equivalent.

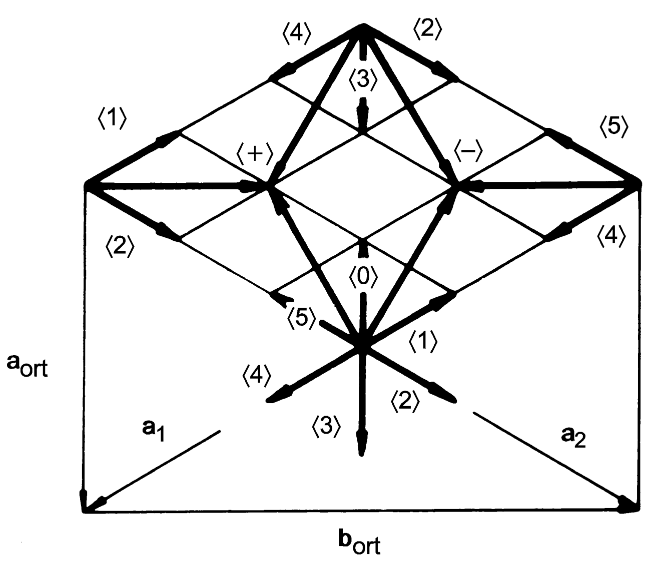

Fig. 9.2.2.9. The nine possible displacements in the structures of polytypes of phyllosilicates. The individual vectors are designated by their conventional numerical characters and the signs +,−. The zero displacement ⟨∗⟩ is not indicated. The relations of these vectors to the basis vectors $\mathbf{a}_1$, $\mathbf{a}_2$ or $\mathbf{a}$, $\mathbf{b}$ are evident.

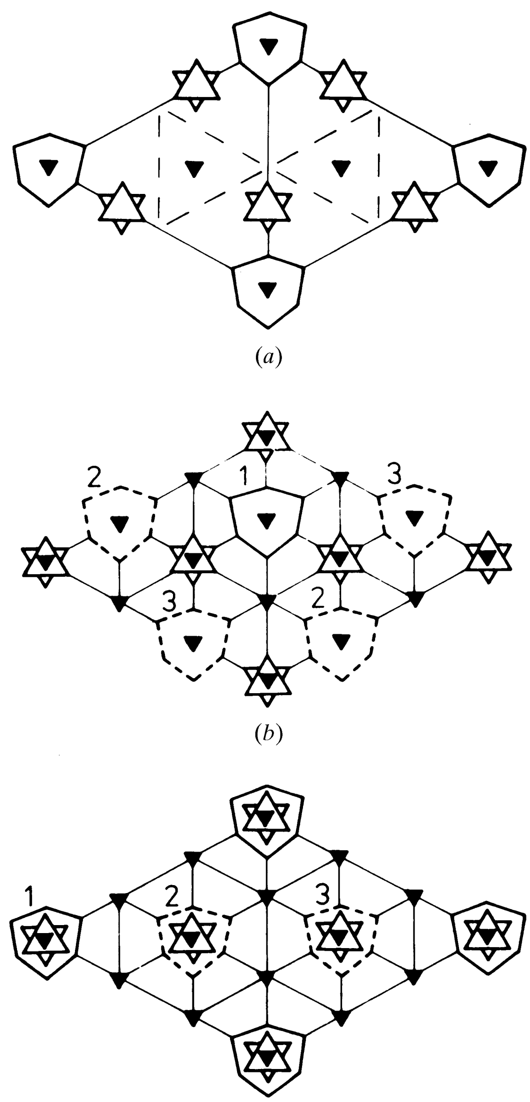

Fig. 9.2.2.10. The *NFZ* relations (*a*) for the pair tetrahedral sheet–homo-octahedral sheet (with shared apical O atoms), (*b*), (*c*) for the pair homo-octahedral sheet–tetrahedral sheet (by hydrogen bonds). The sheets are represented by their symbolic figures; some relevant symmetry elements are also indicated. One of the possible positions (labelled 1) is drawn by full, the other two (2, 3) by broken lines.

references