The SSZ-33 Family

1. The Periodic Building Unit (PerBU) is composed of parallel chains formed by connecting T14 units along ***c*** (as shown in Figure 1) and equals the ***bc*** layer depicted in Figure 2.

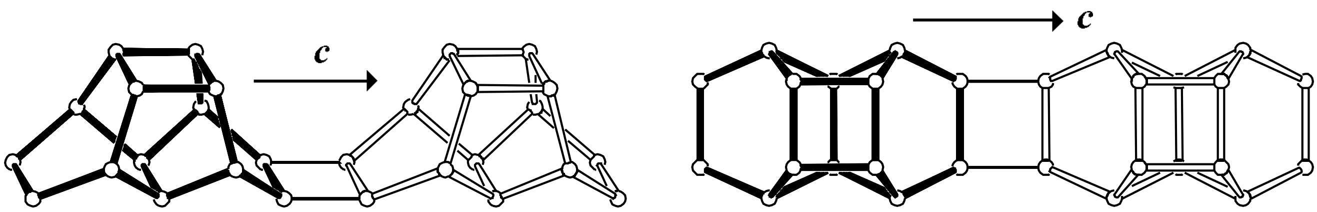
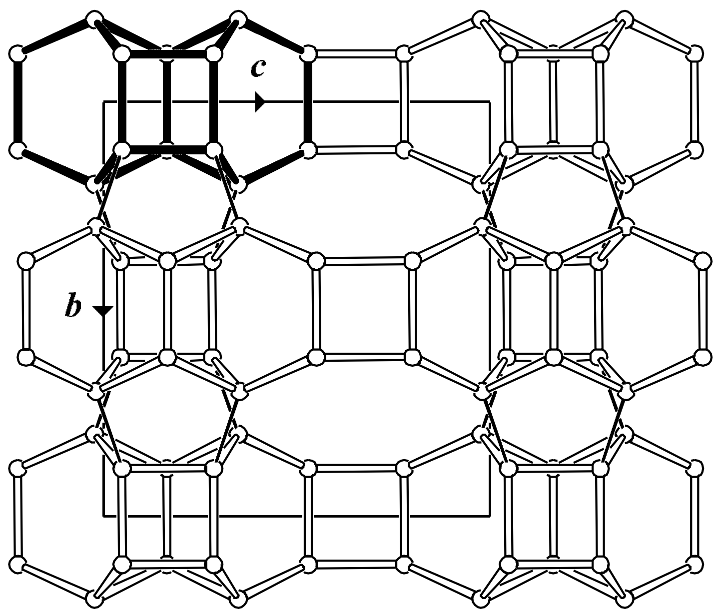
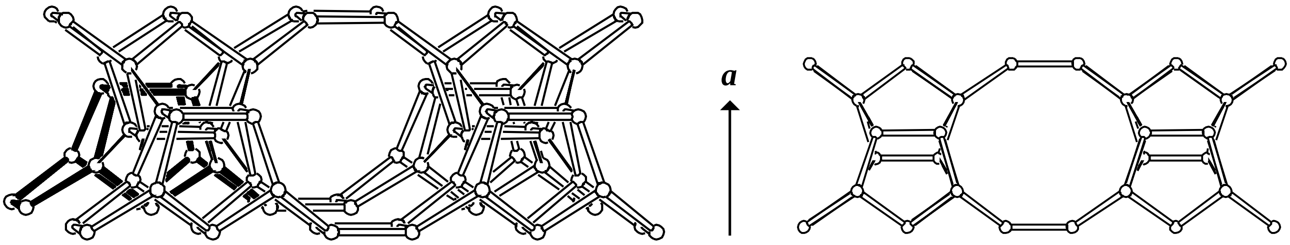


Figure 1: T14 units (in bold), related by pure translations along ***c***, are connected into chains. The chains at left and right differ by a rotation of 90º about the chain axis ***c***

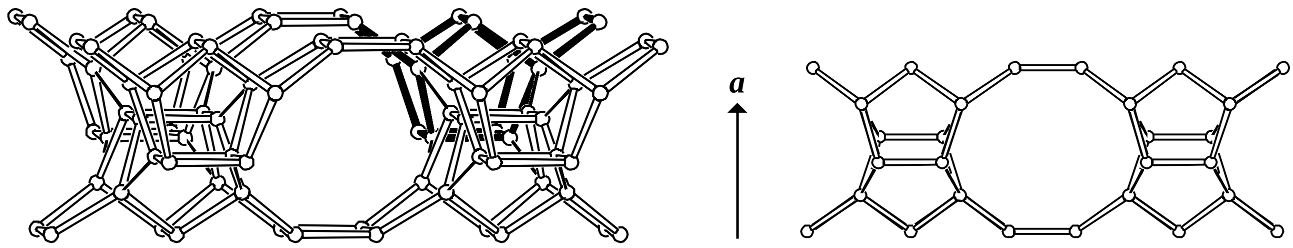


(a)

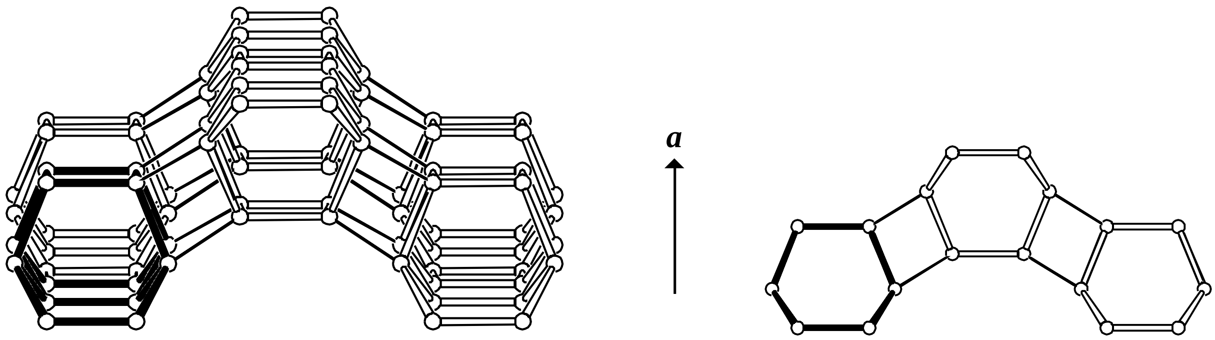
Figure 2: PerBU of the SSZ-33 family viewed along ***a*** (a). Figure 2 is continued on next page



(b)



(c)



(d)

Figure 2 (Continued): PerBU of the SSZ-33 family. Perspective views (left) and parallel projections (right) along ***b*** (b and c), and along ***c*** (d) are shown

In the PerBU, direct neighbouring chains are related by a rotation of 180º about ***b*** (or ***c***). Chains are connected along ***b*** to form a puckered PerBU (Fig. 1d). The PerBU's, depicted in (Fig.1b and c) in perspective view (left) and in parallel projection (right), are identical and related by a lateral shift of ½***b***, by a rotation of 180º about ***b*** or by a mirror operation perpendicular to ***c***.

2. Type of faulting: 1-dimensional stacking disorder of the PerBU's along ***a***.

3. The plane space group of the PerBU is P (2) m m.

4. Connectivity pattern of the PBU:

Neighbouring PerBU's, related by a mirror operation, are connected along ***a*** in three different ways:
(a) the lateral shift of the top layer along ***c*** is zero; denoted as (0) (this connectivity, which shows mirror symmetry (**m**; |) between successive layers, has not been observed yet).
(b) the lateral shift of the top layer is +1/3***c***; denoted as (+1/3). The connectivity exhibits inversion symmetry (**i**; **o**)between successive layers.
(c) the lateral shift of the top layer is -1/3***c***, denoted as (-1/3). This connectivity also shows inversion symmetry (**i**; **o**)between the layers.

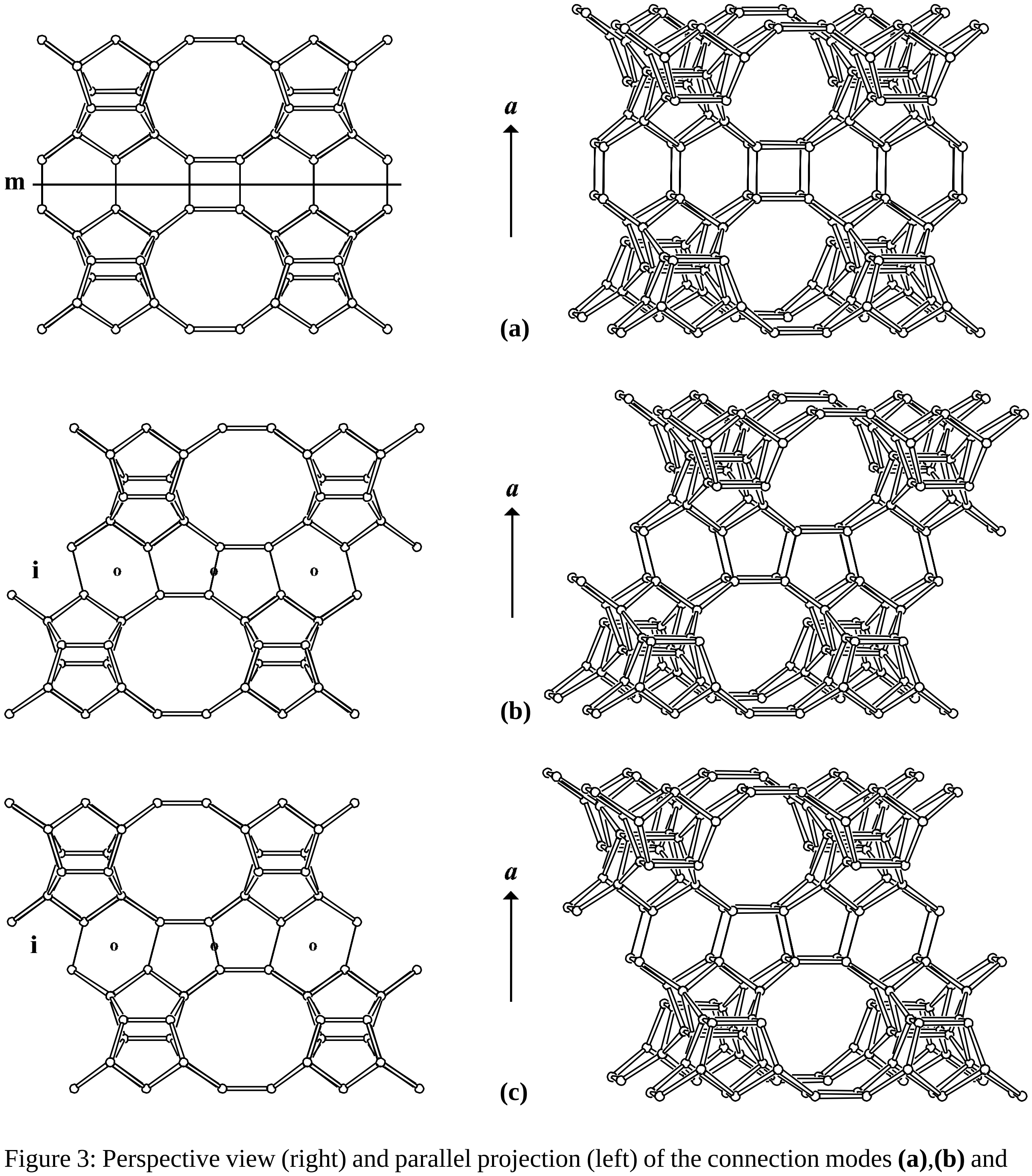


Figure 3: Perspective view (right) and parallel projection (left) of the connection modes **(a)**,**(b)** and **(c)** in the SSZ-33 family of framework types seen along ***b***. In connection mode **(a)** the neighbouring PerBU's are connected through (fused) T6-T6-T4 ring sequences and in connection modes **(b)** and **(c)** through (fused) T6-T5-T5 ring sequences

Once the distribution of the lateral shifts between the layers stacked along ***a*** is known, the 3-dimensional framework is defined.

5. The simplest ordered end-members in the SSZ-33 family are given below. Only end-member 2 has been observed as pure single crystal material and represents the structure with framework type code CON. There is no difference in the projection of the framework of the end-members along ***c***.

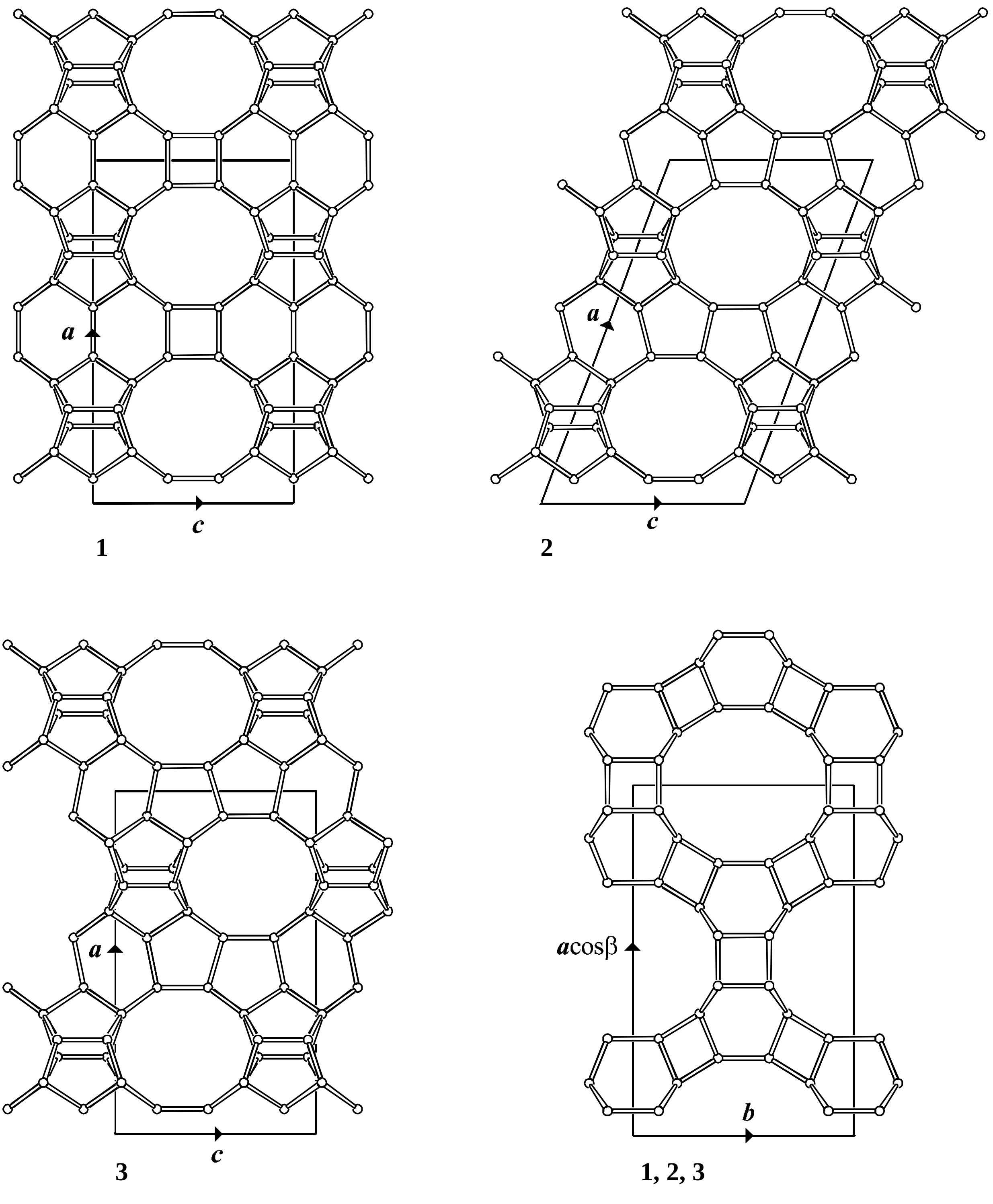


Figure 4: Projections of the simplest ordered end-members in the SSZ-33 family (cf. Table 1 on next page). The projection along ***c*** (last figure) is the same for all three end-members

Table 1: Stacking sequences of PerBU's for the simplest ordered end-members in the SSZ-33 family. The end-member number refers to the framework plots **1-3** on the previous page.

End-Member	***Lateral shifts between subsequent PerBU's stacked along a; shifts are in fractions of c***			***space group***
1	(0);	(0);	(0);........	Pmmm
2	(+1/3);	(+1/3);	(+1/3);.........	C2/m [1,2]
3	(+1/3);	(-1/3);	(+1/3);..........	Pncm [2,3]

[1] This is the end-member with framework type code CON.

[2] Space group is centrosymmetric; the same structure is obtained by reversing the signs of all lateral shifts.

[3] The standard space group Pmna (with ***a***, ***b*** and ***c***) has been transformed to the non-standard space group Pncm (with ***b***, ***c***, and ***a***) for comparison reasons.

6. Disordered materials synthesized and characterized to date:

SSZ-26(1,2), SSZ-33(2,3).

7. Supplementary material

to be added

8. References

(1) S. I. Zones, D. S. Santilli, J. N. Holtermann, T. A. Pecoraro and R. A. Innes, US Patent 4,910,006(1990).

(2) R. F. Lobo, M. Pan, I. Chan, R. C. Medrud, S. I. Zones, P. A. Crozier and M. E. Davis, J. Phys. Chem. **98**, 12040 (1994).

(3) S. I. Zones, US Patent 4,963,337(1990).