

The SBS/SBT Family

1. The Periodic Building Unit (PerBU) - 2. Type of Faulting - 3. The Layer Symmetry
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1. The Periodic Building Unit (PerBU) is the hexagonal layer shown in Figure 1. This layer is built from T24 units (cancranite-cages with ‘handles’) depicted in Figure 2.

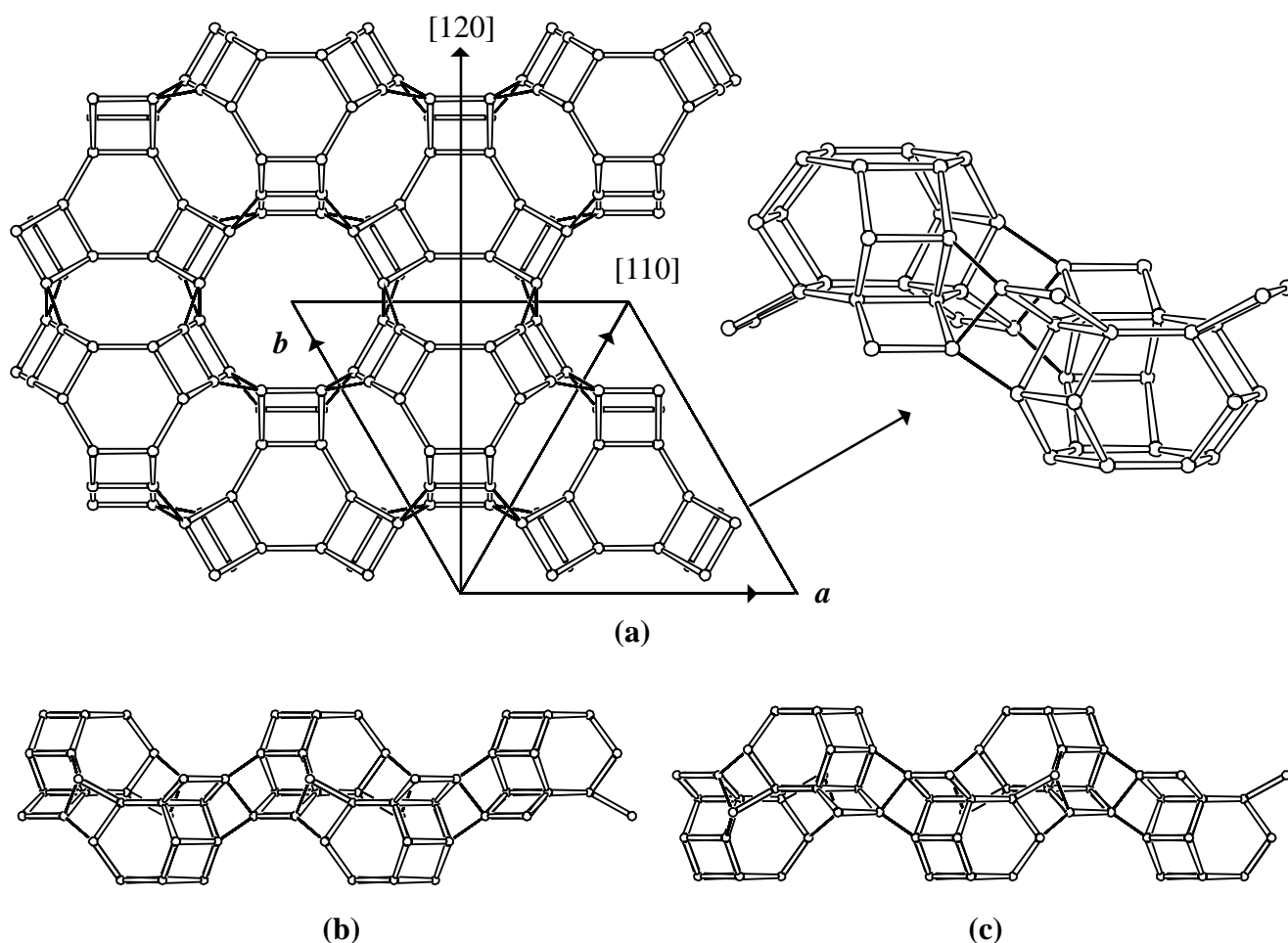


Figure 1: PerBU of the SBS/SBT family seen along c (a; left), details of the linkage of T24-units within the PerBU seen nearly along $[120]$ (a; right) and PerBU seen perpendicular to c (b and c)

The PerBU in the SBS/SBT family is composed of T24-units linked into a hexagonal layer. The linkage is illustrated in Fig. 1a. In Figure 1b and 1c the PerBU is shown along b and along $[110]$, respectively. The layers depicted in Figure 1b and 1c are identical and related by a 60° rotation about the (hexagonal) c -axis or by a mirror operation perpendicular to c ▲

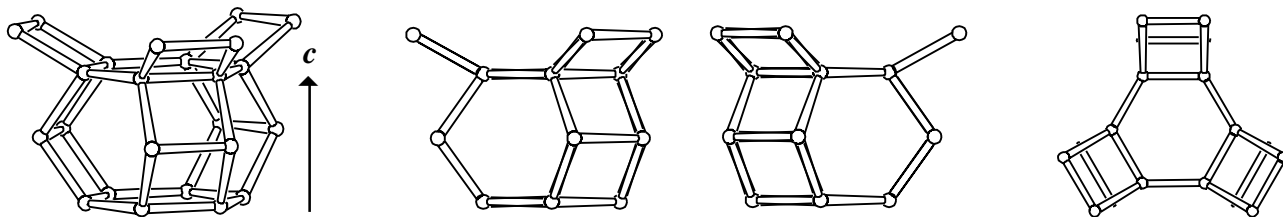


Figure 2. The cancranite cage with 'handles' (T24 unit). From left to right: perspective view perpendicular to c ; parallel views perpendicular to c , after rotation of $+30^\circ$ and -30° about c with respect to the most left drawing; and parallel view down c

2. Type of faulting: 1-dimensional stacking disorder of the PerBU's along $[001]$.

3. The plane space group of the PerBU is $(\bar{3})m1$. ▲

4. Connectivity pattern of the PerBU:

Neighbouring PerBU's can be connected along $[001]$ in two different ways:

(a): the top layer is shifted over $\frac{1}{3}(-a + b)$ before connecting it to the bottom layer. The resulting connectivity exhibits inversion symmetry (\bar{i} ; \circ) between successive layers.

(b): the top layer is rotated over 60° about $[001]$ (followed by the shift vector $\frac{1}{3}(-a + b)$) before connecting it to the bottom layer. The connectivity now shows mirror symmetry (m ; $|$) between successive layers (see also Figure 1(b,c)).

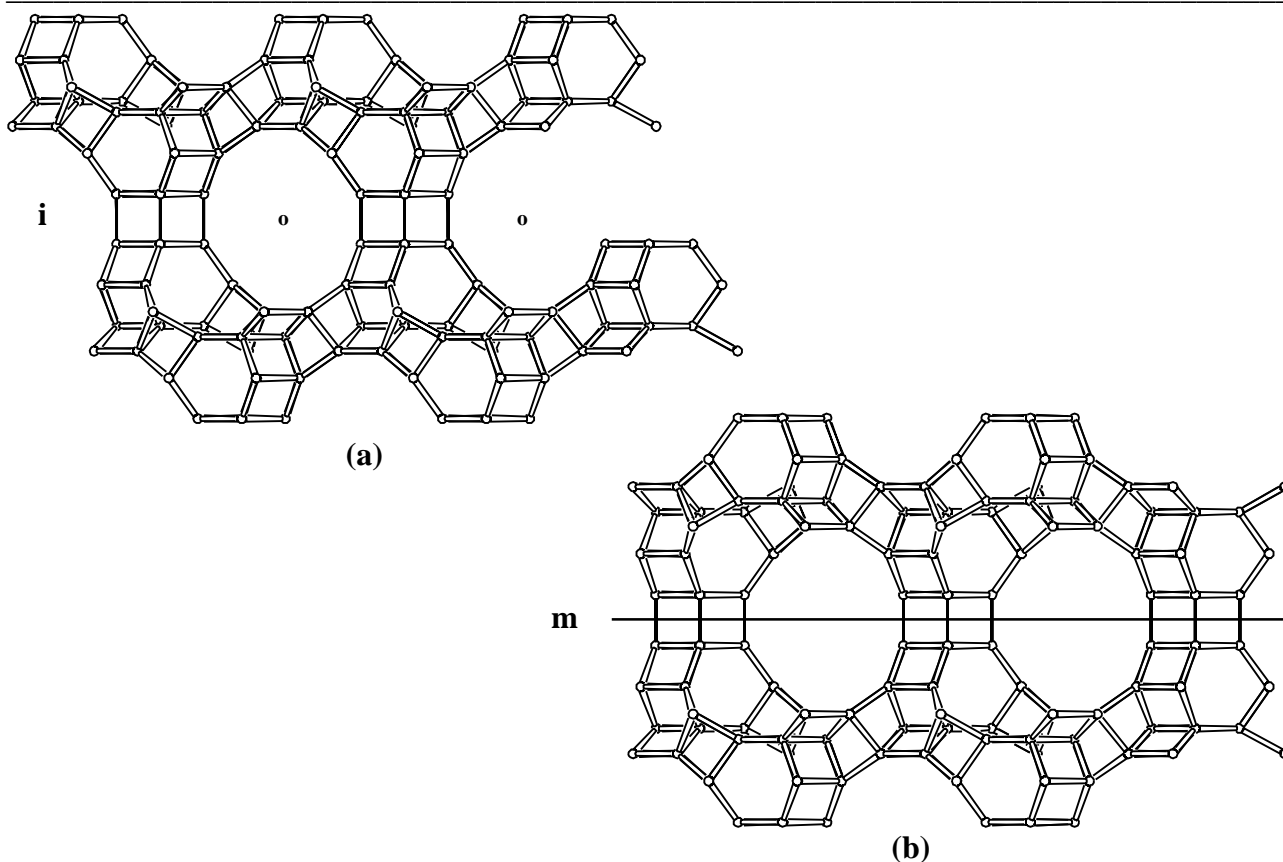


Figure 3. Parallel projection along b of the connection modes (a) and (b)

Once the distribution of the symmetry elements \bar{i} and m between the layers stacked along $[001]$ is known, the 3-dimensional framework is defined. ▲

5. The simplest ordered end-members in the SBS/STB family are shown in Figure 4:

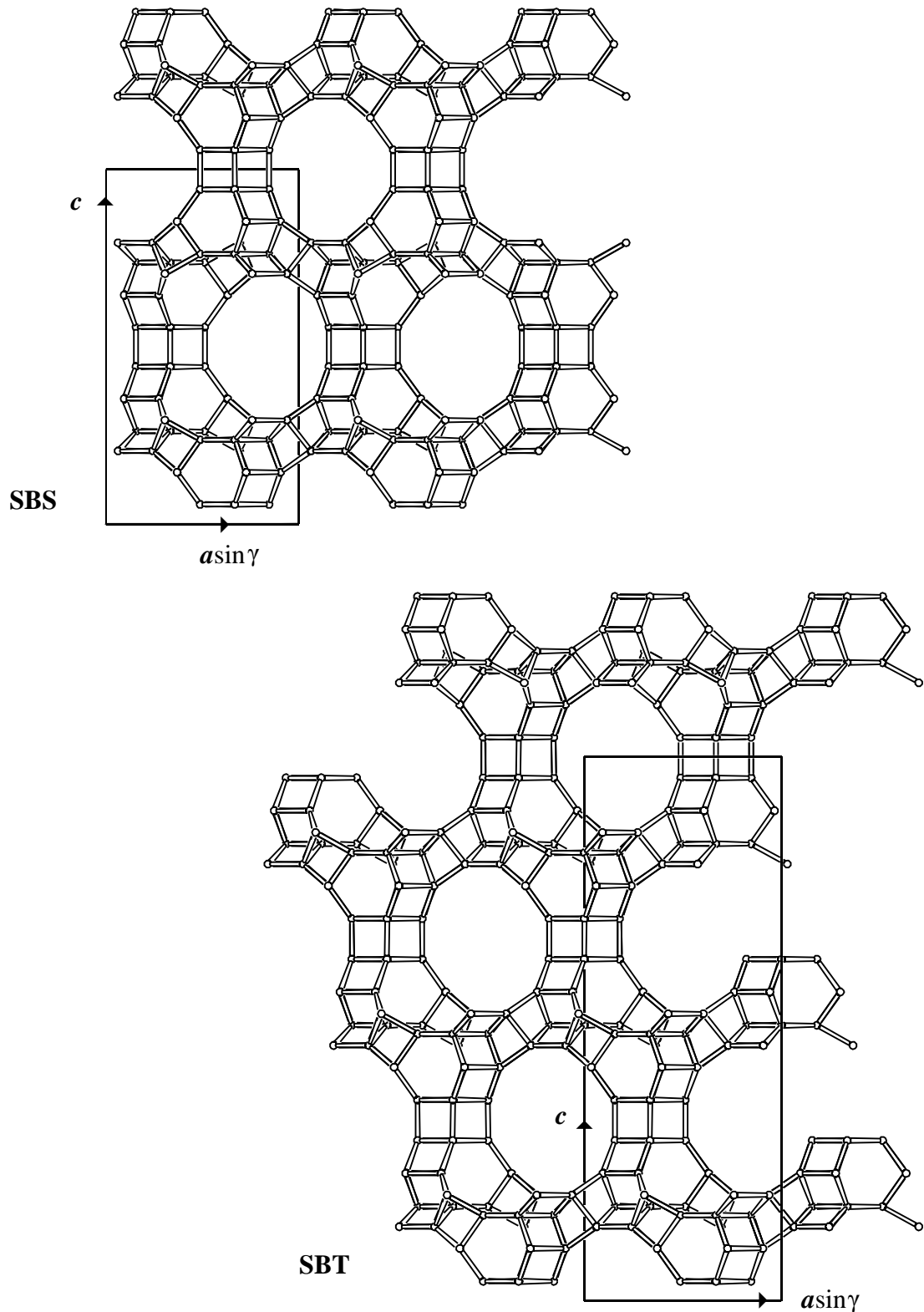


Figure 4. Projection of the unit cell content along the hexagonal [010] axis of the two simplest ordered end-members in the SBS/STB family: SBS (left) and STB (right)

Pure SBS(1) and STB(2) are obtained when neighbouring PerBU's along the [001] are exclusively related by \mathbf{m} and \mathbf{i} , respectively. ▲

6. Disordered materials synthesized and characterized to date:

No disordered materials known to date.

7. Supplementary material

to be added

8. References

- (1) X. Bu, P. Feng and G.D. Stucky, Science **278**, 2080 (1997).
- (2) X. Bu, P. Feng and G.D. Stucky, Science **278**, 2080 (1997).

