Apophyllite ($KCa_4Si_8O_{20}F{\cdot}8H_2O$, $S5_2$) Structure: A4BC16DE28F8_tP116_128_h_a_2i_b_g3i_i-001

This structure originally had the label `A4BC16DE28F8_tP116_128_h_a_2i_b_g3i_i`. Calls to that address will be redirected here.

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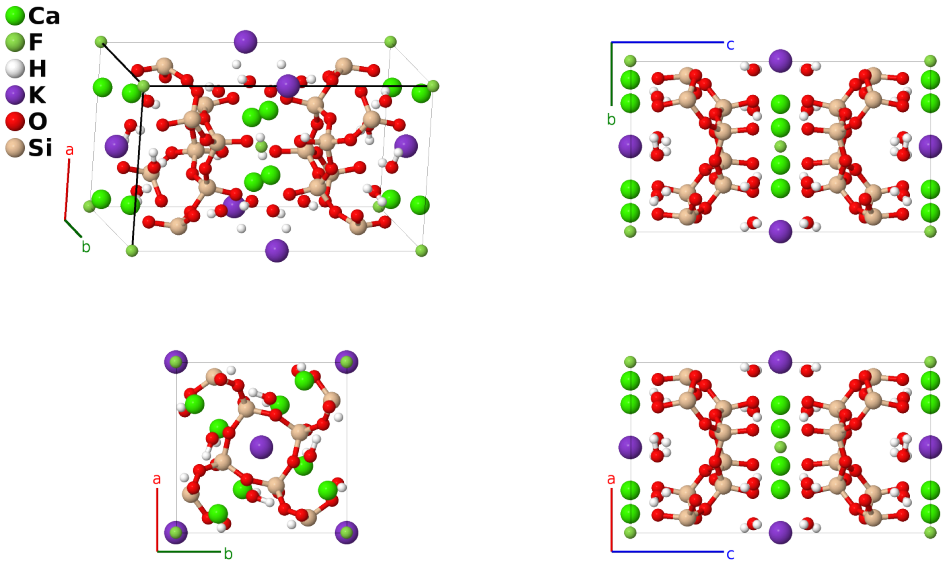
https://aflow.org/p/DPWF

https://aflow.org/p/A4BC16DE28F8_tP116_128_h_a_2i_b_g3i_i-001

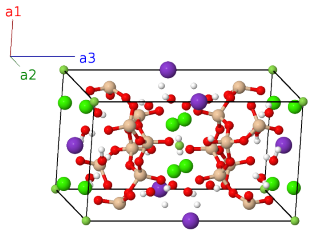


Prototype	$Ca_4FH_{16}KO_{28}Si_8$
AFLOW prototype label	A4BC16DE28F8_tP116_128_h_a_2i_b_g3i_i-001
***Strukturbericht* designation**	$S5_2$
Mineral name	apophyllite
ICSD	24954
Pearson symbol	tP116
Space group number	128
Space group symbol	$P4/mnc$
AFLOW prototype command	`aflow --proto=A4BC16DE28F8_tP116_128_h_a_2i_b_g3i_i-001 --params=`$a, c/a, x_3, x_4, y_4, x_5, y_5, z_5, x_6, y_6, z_6, x_7, y_7, z_7, x_8, y_8, z_8, x_9, y_9, z_9, x_{10}, y_{10}, z_{10}$

- Although we use the structure found by (Chao, 1971), we should note that there is some disagreement between the Chao's X-ray diffraction data and the neutron diffraction data taken by (Prince, 1971): while both agree on the positions of the heavy atoms, Prince's work suggests that some of the hydrogens may form OH radicals rather than water molecules.
- In any case, the fluorine set atoms are usually partially replaced by OH radicals. This sample, which is predominantly fluorine, is technically labeled apophyllite-(KF).

Simple Tetragonal primitive vectors

$$\begin{aligned}\mathbf{a_1} &= a\,\hat{\mathbf{x}}\\ \mathbf{a_2} &= a\,\hat{\mathbf{y}}\\ \mathbf{a_3} &= c\,\hat{\mathbf{z}}\end{aligned}$$



Basis vectors

		Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B_1}$	=	0	=	0	(2a)	F I
$\mathbf{B_2}$	=	$\frac{1}{2}\,\mathbf{a}_1+\frac{1}{2}\,\mathbf{a}_2+\frac{1}{2}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}}+\frac{1}{2}a\,\hat{\mathbf{y}}+\frac{1}{2}c\,\hat{\mathbf{z}}$	(2a)	F I
$\mathbf{B_3}$	=	$\frac{1}{2}\,\mathbf{a}_3$	=	$\frac{1}{2}c\,\hat{\mathbf{z}}$	(2b)	K I
$\mathbf{B_4}$	=	$\frac{1}{2}\,\mathbf{a}_1+\frac{1}{2}\,\mathbf{a}_2$	=	$\frac{1}{2}a\,\hat{\mathbf{x}}+\frac{1}{2}a\,\hat{\mathbf{y}}$	(2b)	K I
$\mathbf{B_5}$	=	$x_3\,\mathbf{a}_1+\left(x_3+\frac{1}{2}\right)\,\mathbf{a}_2+\frac{1}{4}\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}}+a\left(x_3+\frac{1}{2}\right)\,\hat{\mathbf{y}}+\frac{1}{4}c\,\hat{\mathbf{z}}$	(8g)	O I
$\mathbf{B_6}$	=	$-x_3\,\mathbf{a}_1-\left(x_3-\frac{1}{2}\right)\,\mathbf{a}_2+\frac{1}{4}\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}}-a\left(x_3-\frac{1}{2}\right)\,\hat{\mathbf{y}}+\frac{1}{4}c\,\hat{\mathbf{z}}$	(8g)	O I
$\mathbf{B_7}$	=	$-\left(x_3-\frac{1}{2}\right)\,\mathbf{a}_1+x_3\,\mathbf{a}_2+\frac{1}{4}\,\mathbf{a}_3$	=	$-a\left(x_3-\frac{1}{2}\right)\,\hat{\mathbf{x}}+ax_3\,\hat{\mathbf{y}}+\frac{1}{4}c\,\hat{\mathbf{z}}$	(8g)	O I
$\mathbf{B_8}$	=	$\left(x_3+\frac{1}{2}\right)\,\mathbf{a}_1-x_3\,\mathbf{a}_2+\frac{1}{4}\,\mathbf{a}_3$	=	$a\left(x_3+\frac{1}{2}\right)\,\hat{\mathbf{x}}-ax_3\,\hat{\mathbf{y}}+\frac{1}{4}c\,\hat{\mathbf{z}}$	(8g)	O I
$\mathbf{B_9}$	=	$-x_3\,\mathbf{a}_1-\left(x_3-\frac{1}{2}\right)\,\mathbf{a}_2+\frac{3}{4}\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}}-a\left(x_3-\frac{1}{2}\right)\,\hat{\mathbf{y}}+\frac{3}{4}c\,\hat{\mathbf{z}}$	(8g)	O I
$\mathbf{B_{10}}$	=	$x_3\,\mathbf{a}_1+\left(x_3+\frac{1}{2}\right)\,\mathbf{a}_2+\frac{3}{4}\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}}+a\left(x_3+\frac{1}{2}\right)\,\hat{\mathbf{y}}+\frac{3}{4}c\,\hat{\mathbf{z}}$	(8g)	O I
$\mathbf{B_{11}}$	=	$\left(x_3+\frac{1}{2}\right)\,\mathbf{a}_1-x_3\,\mathbf{a}_2+\frac{3}{4}\,\mathbf{a}_3$	=	$a\left(x_3+\frac{1}{2}\right)\,\hat{\mathbf{x}}-ax_3\,\hat{\mathbf{y}}+\frac{3}{4}c\,\hat{\mathbf{z}}$	(8g)	O I
$\mathbf{B_{12}}$	=	$-\left(x_3-\frac{1}{2}\right)\,\mathbf{a}_1+x_3\,\mathbf{a}_2+\frac{3}{4}\,\mathbf{a}_3$	=	$-a\left(x_3-\frac{1}{2}\right)\,\hat{\mathbf{x}}+ax_3\,\hat{\mathbf{y}}+\frac{3}{4}c\,\hat{\mathbf{z}}$	(8g)	O I
$\mathbf{B_{13}}$	=	$x_4\,\mathbf{a}_1+y_4\,\mathbf{a}_2$	=	$ax_4\,\hat{\mathbf{x}}+ay_4\,\hat{\mathbf{y}}$	(8h)	Ca I
$\mathbf{B_{14}}$	=	$-x_4\,\mathbf{a}_1-y_4\,\mathbf{a}_2$	=	$-ax_4\,\hat{\mathbf{x}}-ay_4\,\hat{\mathbf{y}}$	(8h)	Ca I
$\mathbf{B_{15}}$	=	$-y_4\,\mathbf{a}_1+x_4\,\mathbf{a}_2$	=	$-ay_4\,\hat{\mathbf{x}}+ax_4\,\hat{\mathbf{y}}$	(8h)	Ca I
$\mathbf{B_{16}}$	=	$y_4\,\mathbf{a}_1-x_4\,\mathbf{a}_2$	=	$ay_4\,\hat{\mathbf{x}}-ax_4\,\hat{\mathbf{y}}$	(8h)	Ca I
$\mathbf{B_{17}}$	=	$-\left(x_4-\frac{1}{2}\right)\,\mathbf{a}_1+\left(y_4+\frac{1}{2}\right)\,\mathbf{a}_2+\frac{1}{2}\,\mathbf{a}_3$	=	$-a\left(x_4-\frac{1}{2}\right)\,\hat{\mathbf{x}}+a\left(y_4+\frac{1}{2}\right)\,\hat{\mathbf{y}}+\frac{1}{2}c\,\hat{\mathbf{z}}$	(8h)	Ca I
$\mathbf{B_{18}}$	=	$\left(x_4+\frac{1}{2}\right)\,\mathbf{a}_1-\left(y_4-\frac{1}{2}\right)\,\mathbf{a}_2+\frac{1}{2}\,\mathbf{a}_3$	=	$a\left(x_4+\frac{1}{2}\right)\,\hat{\mathbf{x}}-a\left(y_4-\frac{1}{2}\right)\,\hat{\mathbf{y}}+\frac{1}{2}c\,\hat{\mathbf{z}}$	(8h)	Ca I
$\mathbf{B_{19}}$	=	$\left(y_4+\frac{1}{2}\right)\,\mathbf{a}_1+\left(x_4+\frac{1}{2}\right)\,\mathbf{a}_2+\frac{1}{2}\,\mathbf{a}_3$	=	$a\left(y_4+\frac{1}{2}\right)\,\hat{\mathbf{x}}+a\left(x_4+\frac{1}{2}\right)\,\hat{\mathbf{y}}+\frac{1}{2}c\,\hat{\mathbf{z}}$	(8h)	Ca I
$\mathbf{B_{20}}$	=	$-\left(y_4-\frac{1}{2}\right)\,\mathbf{a}_1-\left(x_4-\frac{1}{2}\right)\,\mathbf{a}_2+\frac{1}{2}\,\mathbf{a}_3$	=	$-a\left(y_4-\frac{1}{2}\right)\,\hat{\mathbf{x}}-a\left(x_4-\frac{1}{2}\right)\,\hat{\mathbf{y}}+\frac{1}{2}c\,\hat{\mathbf{z}}$	(8h)	Ca I
$\mathbf{B_{21}}$	=	$x_5\,\mathbf{a}_1+y_5\,\mathbf{a}_2+z_5\,\mathbf{a}_3$	=	$ax_5\,\hat{\mathbf{x}}+ay_5\,\hat{\mathbf{y}}+cz_5\,\hat{\mathbf{z}}$	(16i)	H I
$\mathbf{B_{22}}$	=	$-x_5\,\mathbf{a}_1-y_5\,\mathbf{a}_2+z_5\,\mathbf{a}_3$	=	$-ax_5\,\hat{\mathbf{x}}-ay_5\,\hat{\mathbf{y}}+cz_5\,\hat{\mathbf{z}}$	(16i)	H I
$\mathbf{B_{23}}$	=	$-y_5\,\mathbf{a}_1+x_5\,\mathbf{a}_2+z_5\,\mathbf{a}_3$	=	$-ay_5\,\hat{\mathbf{x}}+ax_5\,\hat{\mathbf{y}}+cz_5\,\hat{\mathbf{z}}$	(16i)	H I
$\mathbf{B_{24}}$	=	$y_5\,\mathbf{a}_1-x_5\,\mathbf{a}_2+z_5\,\mathbf{a}_3$	=	$ay_5\,\hat{\mathbf{x}}-ax_5\,\hat{\mathbf{y}}+cz_5\,\hat{\mathbf{z}}$	(16i)	H I
$\mathbf{B_{25}}$	=	$-\left(x_5-\frac{1}{2}\right)\,\mathbf{a}_1+\left(y_5+\frac{1}{2}\right)\,\mathbf{a}_2-\left(z_5-\frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_5-\frac{1}{2}\right)\,\hat{\mathbf{x}}+a\left(y_5+\frac{1}{2}\right)\,\hat{\mathbf{y}}-c\left(z_5-\frac{1}{2}\right)\,\hat{\mathbf{z}}$	(16i)	H I
$\mathbf{B_{26}}$	=	$\left(x_5+\frac{1}{2}\right)\,\mathbf{a}_1-\left(y_5-\frac{1}{2}\right)\,\mathbf{a}_2-\left(z_5-\frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(x_5+\frac{1}{2}\right)\,\hat{\mathbf{x}}-a\left(y_5-\frac{1}{2}\right)\,\hat{\mathbf{y}}-c\left(z_5-\frac{1}{2}\right)\,\hat{\mathbf{z}}$	(16i)	H I

$$
\begin{array}{lcccll}
\mathbf{B_{27}} & = & \left(y_5+\frac{1}{2}\right)\mathbf{a}_1+\left(x_5+\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(y_5+\frac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_5+\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_5-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
 & & \left(z_5-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{28}} & = & -\left(y_5-\frac{1}{2}\right)\mathbf{a}_1-\left(x_5-\frac{1}{2}\right)\mathbf{a}_2- & = & -a\left(y_5-\frac{1}{2}\right)\hat{\mathbf{x}}-a\left(x_5-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_5-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
 & & \left(z_5-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{29}} & = & -x_5\,\mathbf{a}_1-y_5\,\mathbf{a}_2-z_5\,\mathbf{a}_3 & = & -ax_5\,\hat{\mathbf{x}}-ay_5\,\hat{\mathbf{y}}-cz_5\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
\mathbf{B_{30}} & = & x_5\,\mathbf{a}_1+y_5\,\mathbf{a}_2-z_5\,\mathbf{a}_3 & = & ax_5\,\hat{\mathbf{x}}+ay_5\,\hat{\mathbf{y}}-cz_5\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
\mathbf{B_{31}} & = & y_5\,\mathbf{a}_1-x_5\,\mathbf{a}_2-z_5\,\mathbf{a}_3 & = & ay_5\,\hat{\mathbf{x}}-ax_5\,\hat{\mathbf{y}}-cz_5\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
\mathbf{B_{32}} & = & -y_5\,\mathbf{a}_1+x_5\,\mathbf{a}_2-z_5\,\mathbf{a}_3 & = & -ay_5\,\hat{\mathbf{x}}+ax_5\,\hat{\mathbf{y}}-cz_5\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
\mathbf{B_{33}} & = & \left(x_5+\frac{1}{2}\right)\mathbf{a}_1-\left(y_5-\frac{1}{2}\right)\mathbf{a}_2+ & = & a\left(x_5+\frac{1}{2}\right)\hat{\mathbf{x}}-a\left(y_5-\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_5+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
 & & \left(z_5+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{34}} & = & -\left(x_5-\frac{1}{2}\right)\mathbf{a}_1+\left(y_5+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_5-\frac{1}{2}\right)\hat{\mathbf{x}}+a\left(y_5+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_5+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
 & & \left(z_5+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{35}} & = & -\left(y_5-\frac{1}{2}\right)\mathbf{a}_1-\left(x_5-\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(y_5-\frac{1}{2}\right)\hat{\mathbf{x}}-a\left(x_5-\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_5+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
 & & \left(z_5+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{36}} & = & \left(y_5+\frac{1}{2}\right)\mathbf{a}_1+\left(x_5+\frac{1}{2}\right)\mathbf{a}_2+ & = & a\left(y_5+\frac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_5+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_5+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H I} \\
 & & \left(z_5+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{37}} & = & x_6\,\mathbf{a}_1+y_6\,\mathbf{a}_2+z_6\,\mathbf{a}_3 & = & ax_6\,\hat{\mathbf{x}}+ay_6\,\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
\mathbf{B_{38}} & = & -x_6\,\mathbf{a}_1-y_6\,\mathbf{a}_2+z_6\,\mathbf{a}_3 & = & -ax_6\,\hat{\mathbf{x}}-ay_6\,\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
\mathbf{B_{39}} & = & -y_6\,\mathbf{a}_1+x_6\,\mathbf{a}_2+z_6\,\mathbf{a}_3 & = & -ay_6\,\hat{\mathbf{x}}+ax_6\,\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
\mathbf{B_{40}} & = & y_6\,\mathbf{a}_1-x_6\,\mathbf{a}_2+z_6\,\mathbf{a}_3 & = & ay_6\,\hat{\mathbf{x}}-ax_6\,\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
\mathbf{B_{41}} & = & -\left(x_6-\frac{1}{2}\right)\mathbf{a}_1+\left(y_6+\frac{1}{2}\right)\mathbf{a}_2- & = & -a\left(x_6-\frac{1}{2}\right)\hat{\mathbf{x}}+a\left(y_6+\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_6-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
 & & \left(z_6-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{42}} & = & \left(x_6+\frac{1}{2}\right)\mathbf{a}_1-\left(y_6-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_6+\frac{1}{2}\right)\hat{\mathbf{x}}-a\left(y_6-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_6-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
 & & \left(z_6-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{43}} & = & \left(y_6+\frac{1}{2}\right)\mathbf{a}_1+\left(x_6+\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(y_6+\frac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_6+\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_6-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
 & & \left(z_6-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{44}} & = & -\left(y_6-\frac{1}{2}\right)\mathbf{a}_1-\left(x_6-\frac{1}{2}\right)\mathbf{a}_2- & = & -a\left(y_6-\frac{1}{2}\right)\hat{\mathbf{x}}-a\left(x_6-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_6-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
 & & \left(z_6-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{45}} & = & -x_6\,\mathbf{a}_1-y_6\,\mathbf{a}_2-z_6\,\mathbf{a}_3 & = & -ax_6\,\hat{\mathbf{x}}-ay_6\,\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
\mathbf{B_{46}} & = & x_6\,\mathbf{a}_1+y_6\,\mathbf{a}_2-z_6\,\mathbf{a}_3 & = & ax_6\,\hat{\mathbf{x}}+ay_6\,\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
\mathbf{B_{47}} & = & y_6\,\mathbf{a}_1-x_6\,\mathbf{a}_2-z_6\,\mathbf{a}_3 & = & ay_6\,\hat{\mathbf{x}}-ax_6\,\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
\mathbf{B_{48}} & = & -y_6\,\mathbf{a}_1+x_6\,\mathbf{a}_2-z_6\,\mathbf{a}_3 & = & -ay_6\,\hat{\mathbf{x}}+ax_6\,\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
\mathbf{B_{49}} & = & \left(x_6+\frac{1}{2}\right)\mathbf{a}_1-\left(y_6-\frac{1}{2}\right)\mathbf{a}_2+ & = & a\left(x_6+\frac{1}{2}\right)\hat{\mathbf{x}}-a\left(y_6-\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_6+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
 & & \left(z_6+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{50}} & = & -\left(x_6-\frac{1}{2}\right)\mathbf{a}_1+\left(y_6+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_6-\frac{1}{2}\right)\hat{\mathbf{x}}+a\left(y_6+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_6+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
 & & \left(z_6+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{51}} & = & -\left(y_6-\frac{1}{2}\right)\mathbf{a}_1-\left(x_6-\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(y_6-\frac{1}{2}\right)\hat{\mathbf{x}}-a\left(x_6-\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_6+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
 & & \left(z_6+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{52}} & = & \left(y_6+\frac{1}{2}\right)\mathbf{a}_1+\left(x_6+\frac{1}{2}\right)\mathbf{a}_2+ & = & a\left(y_6+\frac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_6+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_6+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(16i)} \quad \text{H II} \\
 & & \left(z_6+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{53}} & = & x_7\,\mathbf{a}_1+y_7\,\mathbf{a}_2+z_7\,\mathbf{a}_3 & = & ax_7\,\hat{\mathbf{x}}+ay_7\,\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{O II} \\
\mathbf{B_{54}} & = & -x_7\,\mathbf{a}_1-y_7\,\mathbf{a}_2+z_7\,\mathbf{a}_3 & = & -ax_7\,\hat{\mathbf{x}}-ay_7\,\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{O II} \\
\mathbf{B_{55}} & = & -y_7\,\mathbf{a}_1+x_7\,\mathbf{a}_2+z_7\,\mathbf{a}_3 & = & -ay_7\,\hat{\mathbf{x}}+ax_7\,\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{O II} \\
\mathbf{B_{56}} & = & y_7\,\mathbf{a}_1-x_7\,\mathbf{a}_2+z_7\,\mathbf{a}_3 & = & ay_7\,\hat{\mathbf{x}}-ax_7\,\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}} & \text{(16i)} \quad \text{O II}
\end{array}
$$

$$\mathbf{B_{57}} = -\left(x_7-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_7+\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_7-\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_7-\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(y_7+\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_7-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{58}} = \left(x_7+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_7-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_7-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_7+\tfrac{1}{2}\right)\hat{\mathbf{x}}-a\left(y_7-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_7-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{59}} = \left(y_7+\tfrac{1}{2}\right)\mathbf{a}_1+\left(x_7+\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_7-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(y_7+\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_7+\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_7-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{60}} = -\left(y_7-\tfrac{1}{2}\right)\mathbf{a}_1-\left(x_7-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_7-\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(y_7-\tfrac{1}{2}\right)\hat{\mathbf{x}}-a\left(x_7-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_7-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{61}} = -x_7\,\mathbf{a}_1-y_7\,\mathbf{a}_2-z_7\,\mathbf{a}_3 = -ax_7\,\hat{\mathbf{x}}-ay_7\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{62}} = x_7\,\mathbf{a}_1+y_7\,\mathbf{a}_2-z_7\,\mathbf{a}_3 = ax_7\,\hat{\mathbf{x}}+ay_7\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{63}} = y_7\,\mathbf{a}_1-x_7\,\mathbf{a}_2-z_7\,\mathbf{a}_3 = ay_7\,\hat{\mathbf{x}}-ax_7\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{64}} = -y_7\,\mathbf{a}_1+x_7\,\mathbf{a}_2-z_7\,\mathbf{a}_3 = -ay_7\,\hat{\mathbf{x}}+ax_7\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{65}} = \left(x_7+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_7-\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_7+\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_7+\tfrac{1}{2}\right)\hat{\mathbf{x}}-a\left(y_7-\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_7+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{66}} = -\left(x_7-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_7+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_7+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_7-\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(y_7+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_7+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{67}} = -\left(y_7-\tfrac{1}{2}\right)\mathbf{a}_1-\left(x_7-\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_7+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(y_7-\tfrac{1}{2}\right)\hat{\mathbf{x}}-a\left(x_7-\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_7+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{68}} = \left(y_7+\tfrac{1}{2}\right)\mathbf{a}_1+\left(x_7+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_7+\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(y_7+\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_7+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_7+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O II}$$

$$\mathbf{B_{69}} = x_8\,\mathbf{a}_1+y_8\,\mathbf{a}_2+z_8\,\mathbf{a}_3 = ax_8\,\hat{\mathbf{x}}+ay_8\,\hat{\mathbf{y}}+cz_8\,\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{70}} = -x_8\,\mathbf{a}_1-y_8\,\mathbf{a}_2+z_8\,\mathbf{a}_3 = -ax_8\,\hat{\mathbf{x}}-ay_8\,\hat{\mathbf{y}}+cz_8\,\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{71}} = -y_8\,\mathbf{a}_1+x_8\,\mathbf{a}_2+z_8\,\mathbf{a}_3 = -ay_8\,\hat{\mathbf{x}}+ax_8\,\hat{\mathbf{y}}+cz_8\,\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{72}} = y_8\,\mathbf{a}_1-x_8\,\mathbf{a}_2+z_8\,\mathbf{a}_3 = ay_8\,\hat{\mathbf{x}}-ax_8\,\hat{\mathbf{y}}+cz_8\,\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{73}} = -\left(x_8-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_8+\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_8-\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_8-\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(y_8+\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_8-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{74}} = \left(x_8+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_8-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_8-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_8+\tfrac{1}{2}\right)\hat{\mathbf{x}}-a\left(y_8-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_8-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{75}} = \left(y_8+\tfrac{1}{2}\right)\mathbf{a}_1+\left(x_8+\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_8-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(y_8+\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_8+\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_8-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{76}} = -\left(y_8-\tfrac{1}{2}\right)\mathbf{a}_1-\left(x_8-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_8-\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(y_8-\tfrac{1}{2}\right)\hat{\mathbf{x}}-a\left(x_8-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_8-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{77}} = -x_8\,\mathbf{a}_1-y_8\,\mathbf{a}_2-z_8\,\mathbf{a}_3 = -ax_8\,\hat{\mathbf{x}}-ay_8\,\hat{\mathbf{y}}-cz_8\,\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{78}} = x_8\,\mathbf{a}_1+y_8\,\mathbf{a}_2-z_8\,\mathbf{a}_3 = ax_8\,\hat{\mathbf{x}}+ay_8\,\hat{\mathbf{y}}-cz_8\,\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{79}} = y_8\,\mathbf{a}_1-x_8\,\mathbf{a}_2-z_8\,\mathbf{a}_3 = ay_8\,\hat{\mathbf{x}}-ax_8\,\hat{\mathbf{y}}-cz_8\,\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{80}} = -y_8\,\mathbf{a}_1+x_8\,\mathbf{a}_2-z_8\,\mathbf{a}_3 = -ay_8\,\hat{\mathbf{x}}+ax_8\,\hat{\mathbf{y}}-cz_8\,\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{81}} = \left(x_8+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_8-\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_8+\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_8+\tfrac{1}{2}\right)\hat{\mathbf{x}}-a\left(y_8-\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_8+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{82}} = -\left(x_8-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_8+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_8+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_8-\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(y_8+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_8+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{83}} = -\left(y_8-\tfrac{1}{2}\right)\mathbf{a}_1-\left(x_8-\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_8+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(y_8-\tfrac{1}{2}\right)\hat{\mathbf{x}}-a\left(x_8-\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_8+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{84}} = \left(y_8+\tfrac{1}{2}\right)\mathbf{a}_1+\left(x_8+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_8+\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(y_8+\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_8+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_8+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O III}$$

$$\mathbf{B_{85}} = x_9\,\mathbf{a}_1+y_9\,\mathbf{a}_2+z_9\,\mathbf{a}_3 = ax_9\,\hat{\mathbf{x}}+ay_9\,\hat{\mathbf{y}}+cz_9\,\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{86}} = -x_9\,\mathbf{a}_1 - y_9\,\mathbf{a}_2 + z_9\,\mathbf{a}_3 = -ax_9\,\hat{\mathbf{x}} - ay_9\,\hat{\mathbf{y}} + cz_9\,\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{87}} = -y_9\,\mathbf{a}_1 + x_9\,\mathbf{a}_2 + z_9\,\mathbf{a}_3 = -ay_9\,\hat{\mathbf{x}} + ax_9\,\hat{\mathbf{y}} + cz_9\,\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{88}} = y_9\,\mathbf{a}_1 - x_9\,\mathbf{a}_2 + z_9\,\mathbf{a}_3 = ay_9\,\hat{\mathbf{x}} - ax_9\,\hat{\mathbf{y}} + cz_9\,\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{89}} = -\left(x_9 - \tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_9 + \tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_9 - \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_9 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + a\left(y_9 + \tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_9 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{90}} = \left(x_9 + \tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_9 - \tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_9 - \tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_9 + \tfrac{1}{2}\right)\hat{\mathbf{x}} - a\left(y_9 - \tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_9 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{91}} = \left(y_9 + \tfrac{1}{2}\right)\mathbf{a}_1 + \left(x_9 + \tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_9 - \tfrac{1}{2}\right)\mathbf{a}_3 = a\left(y_9 + \tfrac{1}{2}\right)\hat{\mathbf{x}} + a\left(x_9 + \tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_9 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{92}} = -\left(y_9 - \tfrac{1}{2}\right)\mathbf{a}_1 - \left(x_9 - \tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_9 - \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(y_9 - \tfrac{1}{2}\right)\hat{\mathbf{x}} - a\left(x_9 - \tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_9 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{93}} = -x_9\,\mathbf{a}_1 - y_9\,\mathbf{a}_2 - z_9\,\mathbf{a}_3 = -ax_9\,\hat{\mathbf{x}} - ay_9\,\hat{\mathbf{y}} - cz_9\,\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{94}} = x_9\,\mathbf{a}_1 + y_9\,\mathbf{a}_2 - z_9\,\mathbf{a}_3 = ax_9\,\hat{\mathbf{x}} + ay_9\,\hat{\mathbf{y}} - cz_9\,\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{95}} = y_9\,\mathbf{a}_1 - x_9\,\mathbf{a}_2 - z_9\,\mathbf{a}_3 = ay_9\,\hat{\mathbf{x}} - ax_9\,\hat{\mathbf{y}} - cz_9\,\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{96}} = -y_9\,\mathbf{a}_1 + x_9\,\mathbf{a}_2 - z_9\,\mathbf{a}_3 = -ay_9\,\hat{\mathbf{x}} + ax_9\,\hat{\mathbf{y}} - cz_9\,\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{97}} = \left(x_9 + \tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_9 - \tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_9 + \tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_9 + \tfrac{1}{2}\right)\hat{\mathbf{x}} - a\left(y_9 - \tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_9 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{98}} = -\left(x_9 - \tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_9 + \tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_9 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_9 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + a\left(y_9 + \tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_9 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{99}} = -\left(y_9 - \tfrac{1}{2}\right)\mathbf{a}_1 - \left(x_9 - \tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_9 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(y_9 - \tfrac{1}{2}\right)\hat{\mathbf{x}} - a\left(x_9 - \tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_9 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{100}} = \left(y_9 + \tfrac{1}{2}\right)\mathbf{a}_1 + \left(x_9 + \tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_9 + \tfrac{1}{2}\right)\mathbf{a}_3 = a\left(y_9 + \tfrac{1}{2}\right)\hat{\mathbf{x}} + a\left(x_9 + \tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_9 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{O IV}$$

$$\mathbf{B_{101}} = x_{10}\,\mathbf{a}_1 + y_{10}\,\mathbf{a}_2 + z_{10}\,\mathbf{a}_3 = ax_{10}\,\hat{\mathbf{x}} + ay_{10}\,\hat{\mathbf{y}} + cz_{10}\,\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{102}} = -x_{10}\,\mathbf{a}_1 - y_{10}\,\mathbf{a}_2 + z_{10}\,\mathbf{a}_3 = -ax_{10}\,\hat{\mathbf{x}} - ay_{10}\,\hat{\mathbf{y}} + cz_{10}\,\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{103}} = -y_{10}\,\mathbf{a}_1 + x_{10}\,\mathbf{a}_2 + z_{10}\,\mathbf{a}_3 = -ay_{10}\,\hat{\mathbf{x}} + ax_{10}\,\hat{\mathbf{y}} + cz_{10}\,\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{104}} = y_{10}\,\mathbf{a}_1 - x_{10}\,\mathbf{a}_2 + z_{10}\,\mathbf{a}_3 = ay_{10}\,\hat{\mathbf{x}} - ax_{10}\,\hat{\mathbf{y}} + cz_{10}\,\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{105}} = -\left(x_{10} - \tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{10} + \tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{10} - \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{10} - \tfrac{1}{2}\right)\hat{\mathbf{x}} + a\left(y_{10} + \tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{10} - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{106}} = \left(x_{10} + \tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{10} - \tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{10} - \tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{10} + \tfrac{1}{2}\right)\hat{\mathbf{x}} - a\left(y_{10} - \tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{10} - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{107}} = \left(y_{10} + \tfrac{1}{2}\right)\mathbf{a}_1 + \left(x_{10} + \tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{10} - \tfrac{1}{2}\right)\mathbf{a}_3 = a\left(y_{10} + \tfrac{1}{2}\right)\hat{\mathbf{x}} + a\left(x_{10} + \tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{10} - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{108}} = -\left(y_{10} - \tfrac{1}{2}\right)\mathbf{a}_1 - \left(x_{10} - \tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{10} - \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(y_{10} - \tfrac{1}{2}\right)\hat{\mathbf{x}} - a\left(x_{10} - \tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{10} - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{109}} = -x_{10}\,\mathbf{a}_1 - y_{10}\,\mathbf{a}_2 - z_{10}\,\mathbf{a}_3 = -ax_{10}\,\hat{\mathbf{x}} - ay_{10}\,\hat{\mathbf{y}} - cz_{10}\,\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{110}} = x_{10}\,\mathbf{a}_1 + y_{10}\,\mathbf{a}_2 - z_{10}\,\mathbf{a}_3 = ax_{10}\,\hat{\mathbf{x}} + ay_{10}\,\hat{\mathbf{y}} - cz_{10}\,\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{111}} = y_{10}\,\mathbf{a}_1 - x_{10}\,\mathbf{a}_2 - z_{10}\,\mathbf{a}_3 = ay_{10}\,\hat{\mathbf{x}} - ax_{10}\,\hat{\mathbf{y}} - cz_{10}\,\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{112}} = -y_{10}\,\mathbf{a}_1 + x_{10}\,\mathbf{a}_2 - z_{10}\,\mathbf{a}_3 = -ay_{10}\,\hat{\mathbf{x}} + ax_{10}\,\hat{\mathbf{y}} - cz_{10}\,\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{113}} = \left(x_{10} + \tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{10} - \tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{10} + \tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{10} + \tfrac{1}{2}\right)\hat{\mathbf{x}} - a\left(y_{10} - \tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{10} + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{114}} = -\left(x_{10} - \tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{10} + \tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{10} + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{10} - \tfrac{1}{2}\right)\hat{\mathbf{x}} + a\left(y_{10} + \tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{10} + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{115}} = -\left(y_{10} - \tfrac{1}{2}\right)\mathbf{a}_1 - \left(x_{10} - \tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{10} + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(y_{10} - \tfrac{1}{2}\right)\hat{\mathbf{x}} - a\left(x_{10} - \tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{10} + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

$$\mathbf{B_{116}} = \left(y_{10}+\tfrac{1}{2}\right)\mathbf{a}_1+\left(x_{10}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{10}+\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(y_{10}+\tfrac{1}{2}\right)\hat{\mathbf{x}}+a\left(x_{10}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{10}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (16i) \quad \text{Si I}$$

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