

Tetragonal Be₃P₂ Structure:

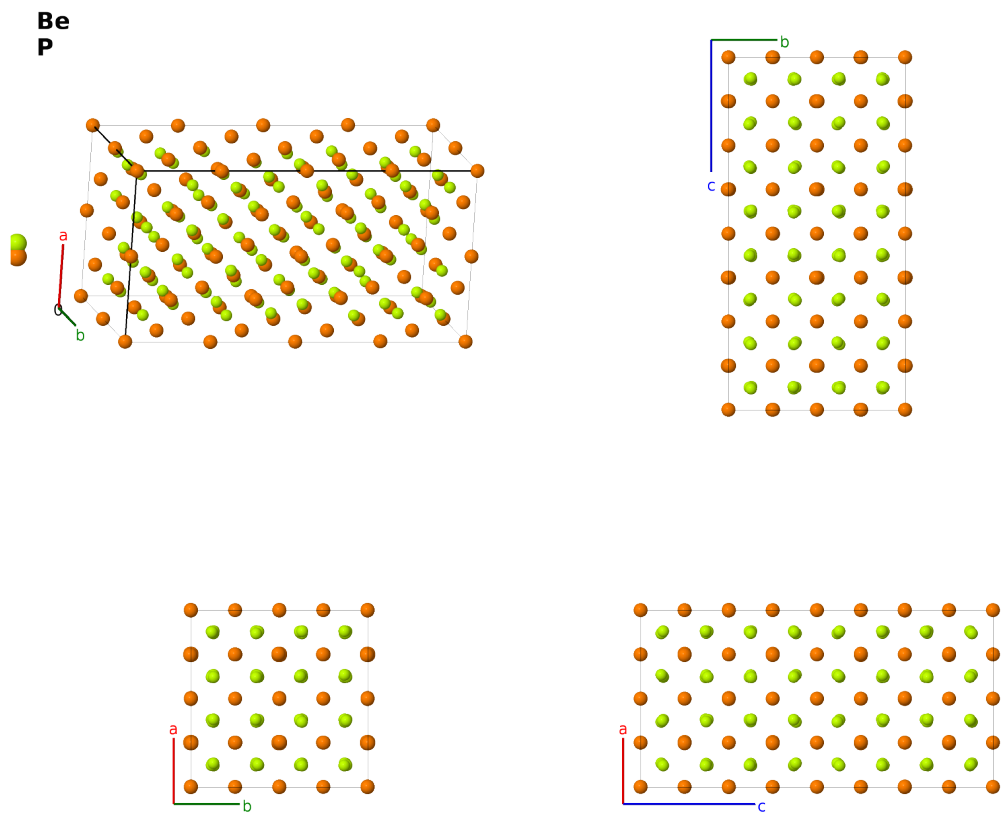
A3B2_tI160_142_3g_abcef-001

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- D. Hicks, M. J. Mehl, M. Esters, C. Osos, O. Levy, G. L. W. Hart, C. Toher, and S. Curtarolo, *The AFLOW Library of Crystallographic Prototypes: Part 3*, Comput. Mater. Sci. **199**, 110450 (2021), doi: 10.1016/j.commatsci.2021.110450.

<https://aflow.org/prototype-encyclopedia/4A1E>

https://aflow.org/prototype-encyclopedia/A3B2_tI160_142_3g_abcef-001



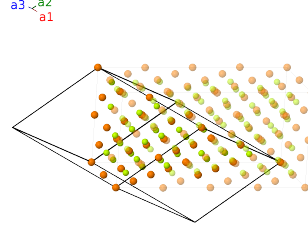
Prototype	Be ₃ P ₂
AFLOW prototype label	A3B2_tI160_142_3g_abcef-001
ICSD	42038
CCDC	1611752
Pearson symbol	tI160
Space group number	142
Space group symbol	$I4_1/acd$

AFLOW prototype command aflow --proto=A3B2_tI160_142_3g_abcef-001
 --params= $a, c/a, x_4, x_5, x_6, y_6, z_6, x_7, y_7, z_7, x_8, y_8, z_8$

- Be₃P₂ can also be found in the cubic bixbyite (Mn₂O₃) structure, and has been reported in the centrosymmetric cubic $D5_5$ (Mg₃P₂) structure.

Body-centered Tetragonal primitive vectors

$$\begin{aligned}\mathbf{a}_1 &= -\frac{1}{2}a\hat{\mathbf{x}} + \frac{1}{2}a\hat{\mathbf{y}} + \frac{1}{2}c\hat{\mathbf{z}} \\ \mathbf{a}_2 &= \frac{1}{2}a\hat{\mathbf{x}} - \frac{1}{2}a\hat{\mathbf{y}} + \frac{1}{2}c\hat{\mathbf{z}} \\ \mathbf{a}_3 &= \frac{1}{2}a\hat{\mathbf{x}} + \frac{1}{2}a\hat{\mathbf{y}} - \frac{1}{2}c\hat{\mathbf{z}}\end{aligned}$$



Basis vectors

	Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B}_1$	$= \frac{5}{8}\mathbf{a}_1 + \frac{3}{8}\mathbf{a}_2 + \frac{1}{4}\mathbf{a}_3$	$=$	$\frac{1}{4}a\hat{\mathbf{y}} + \frac{3}{8}c\hat{\mathbf{z}}$	(8a)	P I
$\mathbf{B}_2$	$= \frac{3}{8}\mathbf{a}_1 + \frac{5}{8}\mathbf{a}_2 + \frac{3}{4}\mathbf{a}_3$	$=$	$\frac{1}{2}a\hat{\mathbf{x}} + \frac{1}{4}a\hat{\mathbf{y}} + \frac{1}{8}c\hat{\mathbf{z}}$	(8a)	P I
$\mathbf{B}_3$	$= \frac{7}{8}\mathbf{a}_1 + \frac{1}{8}\mathbf{a}_2 + \frac{3}{4}\mathbf{a}_3$	$=$	$\frac{3}{4}a\hat{\mathbf{y}} + \frac{1}{8}c\hat{\mathbf{z}}$	(8a)	P I
$\mathbf{B}_4$	$= \frac{1}{8}\mathbf{a}_1 + \frac{7}{8}\mathbf{a}_2 + \frac{1}{4}\mathbf{a}_3$	$=$	$\frac{1}{2}a\hat{\mathbf{x}} - \frac{1}{4}a\hat{\mathbf{y}} + \frac{3}{8}c\hat{\mathbf{z}}$	(8a)	P I
$\mathbf{B}_5$	$= \frac{3}{8}\mathbf{a}_1 + \frac{1}{8}\mathbf{a}_2 + \frac{1}{4}\mathbf{a}_3$	$=$	$\frac{1}{4}a\hat{\mathbf{y}} + \frac{1}{8}c\hat{\mathbf{z}}$	(8b)	P II
$\mathbf{B}_6$	$= \frac{1}{8}\mathbf{a}_1 + \frac{3}{8}\mathbf{a}_2 + \frac{3}{4}\mathbf{a}_3$	$=$	$\frac{1}{2}a\hat{\mathbf{x}} + \frac{1}{4}a\hat{\mathbf{y}} - \frac{1}{8}c\hat{\mathbf{z}}$	(8b)	P II
$\mathbf{B}_7$	$= \frac{5}{8}\mathbf{a}_1 + \frac{7}{8}\mathbf{a}_2 + \frac{3}{4}\mathbf{a}_3$	$=$	$\frac{1}{2}a\hat{\mathbf{x}} + \frac{1}{4}a\hat{\mathbf{y}} + \frac{3}{8}c\hat{\mathbf{z}}$	(8b)	P II
$\mathbf{B}_8$	$= \frac{7}{8}\mathbf{a}_1 + \frac{5}{8}\mathbf{a}_2 + \frac{1}{4}\mathbf{a}_3$	$=$	$\frac{1}{4}a\hat{\mathbf{y}} + \frac{5}{8}c\hat{\mathbf{z}}$	(8b)	P II
$\mathbf{B}_9$	$= 0$	$=$	0	(16c)	P III
$\mathbf{B}_{10}$	$= \frac{1}{2}\mathbf{a}_1 + \frac{1}{2}\mathbf{a}_3$	$=$	$\frac{1}{2}a\hat{\mathbf{y}}$	(16c)	P III
$\mathbf{B}_{11}$	$= \frac{1}{2}\mathbf{a}_2$	$=$	$\frac{1}{4}a\hat{\mathbf{x}} - \frac{1}{4}a\hat{\mathbf{y}} + \frac{1}{4}c\hat{\mathbf{z}}$	(16c)	P III
$\mathbf{B}_{12}$	$= \frac{1}{2}\mathbf{a}_3$	$=$	$\frac{1}{4}a\hat{\mathbf{x}} + \frac{1}{4}a\hat{\mathbf{y}} - \frac{1}{4}c\hat{\mathbf{z}}$	(16c)	P III
$\mathbf{B}_{13}$	$= \frac{1}{2}\mathbf{a}_2 + \frac{1}{2}\mathbf{a}_3$	$=$	$\frac{1}{2}a\hat{\mathbf{x}}$	(16c)	P III
$\mathbf{B}_{14}$	$= \frac{1}{2}\mathbf{a}_1 + \frac{1}{2}\mathbf{a}_2$	$=$	$\frac{1}{2}c\hat{\mathbf{z}}$	(16c)	P III
$\mathbf{B}_{15}$	$= \frac{1}{2}\mathbf{a}_1$	$=$	$-\frac{1}{4}a\hat{\mathbf{x}} + \frac{1}{4}a\hat{\mathbf{y}} + \frac{1}{4}c\hat{\mathbf{z}}$	(16c)	P III
$\mathbf{B}_{16}$	$= \frac{1}{2}\mathbf{a}_1 + \frac{1}{2}\mathbf{a}_2 + \frac{1}{2}\mathbf{a}_3$	$=$	$\frac{1}{4}a\hat{\mathbf{x}} + \frac{1}{4}a\hat{\mathbf{y}} + \frac{1}{4}c\hat{\mathbf{z}}$	(16c)	P III
$\mathbf{B}_{17}$	$= \frac{1}{4}\mathbf{a}_1 + (x_4 + \frac{1}{4})\mathbf{a}_2 + x_4\mathbf{a}_3$	$=$	$ax_4\hat{\mathbf{x}} + \frac{1}{4}c\hat{\mathbf{z}}$	(16e)	P IV
$\mathbf{B}_{18}$	$= \frac{3}{4}\mathbf{a}_1 - (x_4 - \frac{1}{4})\mathbf{a}_2 - (x_4 - \frac{1}{2})\mathbf{a}_3$	$=$	$-ax_4\hat{\mathbf{x}} + \frac{1}{2}a\hat{\mathbf{y}} + \frac{1}{4}c\hat{\mathbf{z}}$	(16e)	P IV
$\mathbf{B}_{19}$	$= (x_4 + \frac{1}{4})\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 + x_4\mathbf{a}_3$	$=$	$\frac{1}{4}a\hat{\mathbf{x}} + a(x_4 - \frac{1}{4})\hat{\mathbf{y}} + \frac{1}{2}c\hat{\mathbf{z}}$	(16e)	P IV
$\mathbf{B}_{20}$	$= -(x_4 - \frac{1}{4})\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 - (x_4 - \frac{1}{2})\mathbf{a}_3$	$=$	$\frac{1}{4}a\hat{\mathbf{x}} - a(x_4 - \frac{1}{4})\hat{\mathbf{y}}$	(16e)	P IV
$\mathbf{B}_{21}$	$= \frac{3}{4}\mathbf{a}_1 - (x_4 - \frac{3}{4})\mathbf{a}_2 - x_4\mathbf{a}_3$	$=$	$-ax_4\hat{\mathbf{x}} + \frac{3}{4}c\hat{\mathbf{z}}$	(16e)	P IV
$\mathbf{B}_{22}$	$= \frac{1}{4}\mathbf{a}_1 + (x_4 + \frac{3}{4})\mathbf{a}_2 + (x_4 + \frac{1}{2})\mathbf{a}_3$	$=$	$a(x_4 + \frac{1}{2})\hat{\mathbf{x}} + \frac{1}{4}c\hat{\mathbf{z}}$	(16e)	P IV

$$\begin{aligned}
\mathbf{B}_{23} &= -\left(x_4 - \frac{3}{4}\right) \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 - x_4 \mathbf{a}_3 = -\frac{1}{4}a \hat{\mathbf{x}} - a\left(x_4 - \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{2}c \hat{\mathbf{z}} & (16e) & \text{P IV} \\
\mathbf{B}_{24} &= \left(x_4 + \frac{3}{4}\right) \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 + \left(x_4 + \frac{1}{2}\right) \mathbf{a}_3 = \frac{1}{4}a \hat{\mathbf{x}} + a\left(x_4 + \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{2}c \hat{\mathbf{z}} & (16e) & \text{P IV} \\
\mathbf{B}_{25} &= \left(x_5 + \frac{3}{8}\right) \mathbf{a}_1 + \left(x_5 + \frac{1}{8}\right) \mathbf{a}_2 + \left(2x_5 + \frac{1}{4}\right) \mathbf{a}_3 = ax_5 \hat{\mathbf{x}} + a\left(x_5 + \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{8}c \hat{\mathbf{z}} & (16f) & \text{P V} \\
\mathbf{B}_{26} &= -\left(x_5 - \frac{3}{8}\right) \mathbf{a}_1 - \left(x_5 - \frac{1}{8}\right) \mathbf{a}_2 - \left(2x_5 - \frac{1}{4}\right) \mathbf{a}_3 = -ax_5 \hat{\mathbf{x}} - a\left(x_5 - \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{8}c \hat{\mathbf{z}} & (16f) & \text{P V} \\
\mathbf{B}_{27} &= \left(x_5 + \frac{1}{8}\right) \mathbf{a}_1 - \left(x_5 - \frac{3}{8}\right) \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3 = -a\left(x_5 - \frac{1}{2}\right) \hat{\mathbf{x}} + a\left(x_5 + \frac{1}{4}\right) \hat{\mathbf{y}} - \frac{1}{8}c \hat{\mathbf{z}} & (16f) & \text{P V} \\
\mathbf{B}_{28} &= -\left(x_5 - \frac{1}{8}\right) \mathbf{a}_1 + \left(x_5 + \frac{3}{8}\right) \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3 = a\left(x_5 + \frac{1}{2}\right) \hat{\mathbf{x}} - a\left(x_5 - \frac{1}{4}\right) \hat{\mathbf{y}} - \frac{1}{8}c \hat{\mathbf{z}} & (16f) & \text{P V} \\
\mathbf{B}_{29} &= -\left(x_5 - \frac{5}{8}\right) \mathbf{a}_1 - \left(x_5 - \frac{7}{8}\right) \mathbf{a}_2 - \left(2x_5 - \frac{3}{4}\right) \mathbf{a}_3 = -a\left(x_5 - \frac{1}{2}\right) \hat{\mathbf{x}} - a\left(x_5 - \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{3}{8}c \hat{\mathbf{z}} & (16f) & \text{P V} \\
\mathbf{B}_{30} &= \left(x_5 + \frac{5}{8}\right) \mathbf{a}_1 + \left(x_5 + \frac{7}{8}\right) \mathbf{a}_2 + \left(2x_5 + \frac{3}{4}\right) \mathbf{a}_3 = a\left(x_5 + \frac{1}{2}\right) \hat{\mathbf{x}} + a\left(x_5 + \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{3}{8}c \hat{\mathbf{z}} & (16f) & \text{P V} \\
\mathbf{B}_{31} &= -\left(x_5 - \frac{7}{8}\right) \mathbf{a}_1 + \left(x_5 + \frac{5}{8}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = ax_5 \hat{\mathbf{x}} - a\left(x_5 - \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{5}{8}c \hat{\mathbf{z}} & (16f) & \text{P V} \\
\mathbf{B}_{32} &= \left(x_5 + \frac{7}{8}\right) \mathbf{a}_1 - \left(x_5 - \frac{5}{8}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = -ax_5 \hat{\mathbf{x}} + a\left(x_5 + \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{5}{8}c \hat{\mathbf{z}} & (16f) & \text{P V} \\
\mathbf{B}_{33} &= (y_6 + z_6) \mathbf{a}_1 + (x_6 + z_6) \mathbf{a}_2 + (x_6 + y_6) \mathbf{a}_3 = ax_6 \hat{\mathbf{x}} + ay_6 \hat{\mathbf{y}} + cz_6 \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{34} &= \left(-y_6 + z_6 + \frac{1}{2}\right) \mathbf{a}_1 - \left(x_6 - z_6\right) \mathbf{a}_2 - \left(x_6 + y_6 - \frac{1}{2}\right) \mathbf{a}_3 = -ax_6 \hat{\mathbf{x}} - a\left(y_6 - \frac{1}{2}\right) \hat{\mathbf{y}} + cz_6 \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{35} &= (x_6 + z_6) \mathbf{a}_1 + \left(-y_6 + z_6 + \frac{1}{2}\right) \mathbf{a}_2 + (x_6 - y_6) \mathbf{a}_3 = -a\left(y_6 - \frac{1}{4}\right) \hat{\mathbf{x}} + a\left(x_6 - \frac{1}{4}\right) \hat{\mathbf{y}} + c\left(z_6 + \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{36} &= -\left(x_6 - z_6\right) \mathbf{a}_1 + (y_6 + z_6) \mathbf{a}_2 + \left(-x_6 + y_6 + \frac{1}{2}\right) \mathbf{a}_3 = a\left(y_6 + \frac{1}{4}\right) \hat{\mathbf{x}} - a\left(x_6 - \frac{1}{4}\right) \hat{\mathbf{y}} + c\left(z_6 - \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{37} &= (y_6 - z_6) \mathbf{a}_1 - \left(x_6 + z_6 - \frac{1}{2}\right) \mathbf{a}_2 + \left(-x_6 + y_6 + \frac{1}{2}\right) \mathbf{a}_3 = -a\left(x_6 - \frac{1}{2}\right) \hat{\mathbf{x}} + ay_6 \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{38} &= -\left(y_6 + z_6 - \frac{1}{2}\right) \mathbf{a}_1 + \left(x_6 - z_6 + \frac{1}{2}\right) \mathbf{a}_2 + (x_6 - y_6) \mathbf{a}_3 = ax_6 \hat{\mathbf{x}} - ay_6 \hat{\mathbf{y}} - c\left(z_6 - \frac{1}{2}\right) \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{39} &= \left(x_6 - z_6 + \frac{1}{2}\right) \mathbf{a}_1 + (y_6 - z_6) \mathbf{a}_2 + (x_6 + y_6) \mathbf{a}_3 = a\left(y_6 - \frac{1}{4}\right) \hat{\mathbf{x}} + a\left(x_6 + \frac{1}{4}\right) \hat{\mathbf{y}} - c\left(z_6 - \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{40} &= -\left(x_6 + z_6 - \frac{1}{2}\right) \mathbf{a}_1 - \left(y_6 + z_6 - \frac{1}{2}\right) \mathbf{a}_2 - \left(x_6 + y_6 - \frac{1}{2}\right) \mathbf{a}_3 = -a\left(y_6 - \frac{1}{4}\right) \hat{\mathbf{x}} - a\left(x_6 - \frac{1}{4}\right) \hat{\mathbf{y}} - c\left(z_6 - \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{41} &= -(y_6 + z_6) \mathbf{a}_1 - (x_6 + z_6) \mathbf{a}_2 - (x_6 + y_6) \mathbf{a}_3 = -ax_6 \hat{\mathbf{x}} - ay_6 \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{42} &= \left(y_6 - z_6 + \frac{1}{2}\right) \mathbf{a}_1 + \left(x_6 - z_6\right) \mathbf{a}_2 + \left(x_6 + y_6 + \frac{1}{2}\right) \mathbf{a}_3 = ax_6 \hat{\mathbf{x}} + a\left(y_6 + \frac{1}{2}\right) \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{43} &= -\left(x_6 + z_6\right) \mathbf{a}_1 + \left(y_6 - z_6 + \frac{1}{2}\right) \mathbf{a}_2 - (x_6 - y_6) \mathbf{a}_3 = a\left(y_6 + \frac{1}{4}\right) \hat{\mathbf{x}} - a\left(x_6 + \frac{1}{4}\right) \hat{\mathbf{y}} - c\left(z_6 - \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{44} &= \left(x_6 - z_6\right) \mathbf{a}_1 - (y_6 + z_6) \mathbf{a}_2 + \left(x_6 - y_6 + \frac{1}{2}\right) \mathbf{a}_3 = -a\left(y_6 - \frac{1}{4}\right) \hat{\mathbf{x}} + a\left(x_6 + \frac{1}{4}\right) \hat{\mathbf{y}} - c\left(z_6 + \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{45} &= -\left(y_6 - z_6\right) \mathbf{a}_1 + \left(x_6 + z_6 + \frac{1}{2}\right) \mathbf{a}_2 + \left(x_6 - y_6 + \frac{1}{2}\right) \mathbf{a}_3 = a\left(x_6 + \frac{1}{2}\right) \hat{\mathbf{x}} - ay_6 \hat{\mathbf{y}} + cz_6 \hat{\mathbf{z}} & (32g) & \text{Be I} \\
\mathbf{B}_{46} &= \left(y_6 + z_6 + \frac{1}{2}\right) \mathbf{a}_1 + \left(-x_6 + z_6 + \frac{1}{2}\right) \mathbf{a}_2 - (x_6 - y_6) \mathbf{a}_3 = -ax_6 \hat{\mathbf{x}} + ay_6 \hat{\mathbf{y}} + c\left(z_6 + \frac{1}{2}\right) \hat{\mathbf{z}} & (32g) & \text{Be I}
\end{aligned}$$

$\mathbf{B}_{47} =$	$\begin{pmatrix} -x_6 + z_6 + \frac{1}{2} \\ y_6 - z_6 \end{pmatrix} \mathbf{a}_1 - (x_6 + y_6) \mathbf{a}_3$	$=$	$-a(y_6 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_6 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_6 + \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be I
$\mathbf{B}_{48} =$	$\begin{pmatrix} x_6 + z_6 + \frac{1}{2} \\ y_6 + z_6 + \frac{1}{2} \\ x_6 + y_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_1 + \mathbf{a}_2 + \mathbf{a}_3$	$=$	$a(y_6 + \frac{1}{4}) \hat{\mathbf{x}} + a(x_6 + \frac{1}{4}) \hat{\mathbf{y}} + c(z_6 + \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be I
$\mathbf{B}_{49} =$	$(y_7 + z_7) \mathbf{a}_1 + (x_7 + z_7) \mathbf{a}_2 + (x_7 + y_7) \mathbf{a}_3$	$=$	$ax_7 \hat{\mathbf{x}} + ay_7 \hat{\mathbf{y}} + cz_7 \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{50} =$	$\begin{pmatrix} -y_7 + z_7 + \frac{1}{2} \\ x_7 - z_7 \end{pmatrix} \mathbf{a}_1 - (x_7 + y_7 - \frac{1}{2}) \mathbf{a}_3$	$=$	$-ax_7 \hat{\mathbf{x}} - a(y_7 - \frac{1}{2}) \hat{\mathbf{y}} + cz_7 \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{51} =$	$(x_7 + z_7) \mathbf{a}_1 + (-y_7 + z_7 + \frac{1}{2}) \mathbf{a}_2 + (x_7 - y_7) \mathbf{a}_3$	$=$	$-a(y_7 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_7 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_7 + \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{52} =$	$-(x_7 - z_7) \mathbf{a}_1 + (y_7 + z_7) \mathbf{a}_2 + (-x_7 + y_7 + \frac{1}{2}) \mathbf{a}_3$	$=$	$a(y_7 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_7 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_7 - \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{53} =$	$(y_7 - z_7) \mathbf{a}_1 - (x_7 + z_7 - \frac{1}{2}) \mathbf{a}_2 + (-x_7 + y_7 + \frac{1}{2}) \mathbf{a}_3$	$=$	$-a(x_7 - \frac{1}{2}) \hat{\mathbf{x}} + ay_7 \hat{\mathbf{y}} - cz_7 \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{54} =$	$-(y_7 + z_7 - \frac{1}{2}) \mathbf{a}_1 + (x_7 - z_7 + \frac{1}{2}) \mathbf{a}_2 + (x_7 - y_7) \mathbf{a}_3$	$=$	$ax_7 \hat{\mathbf{x}} - ay_7 \hat{\mathbf{y}} - c(z_7 - \frac{1}{2}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{55} =$	$(x_7 - z_7 + \frac{1}{2}) \mathbf{a}_1 + (y_7 - z_7) \mathbf{a}_2 + (x_7 + y_7) \mathbf{a}_3$	$=$	$a(y_7 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_7 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_7 - \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{56} =$	$-(x_7 + z_7 - \frac{1}{2}) \mathbf{a}_1 - (y_7 + z_7 - \frac{1}{2}) \mathbf{a}_2 - (x_7 + y_7 - \frac{1}{2}) \mathbf{a}_3$	$=$	$-a(y_7 - \frac{1}{4}) \hat{\mathbf{x}} - a(x_7 - \frac{1}{4}) \hat{\mathbf{y}} - c(z_7 - \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{57} =$	$-(y_7 + z_7) \mathbf{a}_1 - (x_7 + z_7) \mathbf{a}_2 - (x_7 + y_7) \mathbf{a}_3$	$=$	$-ax_7 \hat{\mathbf{x}} - ay_7 \hat{\mathbf{y}} - cz_7 \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{58} =$	$(y_7 - z_7 + \frac{1}{2}) \mathbf{a}_1 + (x_7 - z_7) \mathbf{a}_2 + (x_7 + y_7 + \frac{1}{2}) \mathbf{a}_3$	$=$	$ax_7 \hat{\mathbf{x}} + a(y_7 + \frac{1}{2}) \hat{\mathbf{y}} - cz_7 \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{59} =$	$-(x_7 + z_7) \mathbf{a}_1 + (y_7 - z_7 + \frac{1}{2}) \mathbf{a}_2 - (x_7 - y_7) \mathbf{a}_3$	$=$	$a(y_7 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_7 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_7 - \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{60} =$	$(x_7 - z_7) \mathbf{a}_1 - (y_7 + z_7) \mathbf{a}_2 + (x_7 - y_7 + \frac{1}{2}) \mathbf{a}_3$	$=$	$-a(y_7 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_7 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_7 + \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{61} =$	$-(y_7 - z_7) \mathbf{a}_1 + (x_7 + z_7 + \frac{1}{2}) \mathbf{a}_2 + (x_7 - y_7 + \frac{1}{2}) \mathbf{a}_3$	$=$	$a(x_7 + \frac{1}{2}) \hat{\mathbf{x}} - ay_7 \hat{\mathbf{y}} + cz_7 \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{62} =$	$(y_7 + z_7 + \frac{1}{2}) \mathbf{a}_1 + (-x_7 + z_7 + \frac{1}{2}) \mathbf{a}_2 - (x_7 - y_7) \mathbf{a}_3$	$=$	$-ax_7 \hat{\mathbf{x}} + ay_7 \hat{\mathbf{y}} + c(z_7 + \frac{1}{2}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{63} =$	$(-x_7 + z_7 + \frac{1}{2}) \mathbf{a}_1 - (y_7 - z_7) \mathbf{a}_2 - (x_7 + y_7) \mathbf{a}_3$	$=$	$-a(y_7 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_7 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_7 + \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{64} =$	$(x_7 + z_7 + \frac{1}{2}) \mathbf{a}_1 + (y_7 + z_7 + \frac{1}{2}) \mathbf{a}_2 + (x_7 + y_7 + \frac{1}{2}) \mathbf{a}_3$	$=$	$a(y_7 + \frac{1}{4}) \hat{\mathbf{x}} + a(x_7 + \frac{1}{4}) \hat{\mathbf{y}} + c(z_7 + \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be II
$\mathbf{B}_{65} =$	$(y_8 + z_8) \mathbf{a}_1 + (x_8 + z_8) \mathbf{a}_2 + (x_8 + y_8) \mathbf{a}_3$	$=$	$ax_8 \hat{\mathbf{x}} + ay_8 \hat{\mathbf{y}} + cz_8 \hat{\mathbf{z}}$	$(32g)$	Be III
$\mathbf{B}_{66} =$	$(-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_1 - (x_8 - z_8) \mathbf{a}_2 - (x_8 + y_8 - \frac{1}{2}) \mathbf{a}_3$	$=$	$-ax_8 \hat{\mathbf{x}} - a(y_8 - \frac{1}{2}) \hat{\mathbf{y}} + cz_8 \hat{\mathbf{z}}$	$(32g)$	Be III
$\mathbf{B}_{67} =$	$(x_8 + z_8) \mathbf{a}_1 + (-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_2 + (x_8 - y_8) \mathbf{a}_3$	$=$	$-a(y_8 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_8 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_8 + \frac{1}{4}) \hat{\mathbf{z}}$	$(32g)$	Be III
$\mathbf{B}_{68} =$	$-(x_8 - z_8) \mathbf{a}_1 + (y_8 + z_8) \mathbf{a}_2 + (-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_3$	$=$	$a(y_8 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_8 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_8 - \frac{1$		

$$\begin{aligned}
\mathbf{B}_{69} &= (y_8 - z_8) \mathbf{a}_1 - (x_8 + z_8 - \frac{1}{2}) \mathbf{a}_2 + (-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_3 = -a (x_8 - \frac{1}{2}) \hat{\mathbf{x}} + ay_8 \hat{\mathbf{y}} - cz_8 \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{70} &= -(y_8 + z_8 - \frac{1}{2}) \mathbf{a}_1 + (x_8 - z_8 + \frac{1}{2}) \mathbf{a}_2 + (x_8 - y_8) \mathbf{a}_3 = ax_8 \hat{\mathbf{x}} - ay_8 \hat{\mathbf{y}} - c (z_8 - \frac{1}{2}) \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{71} &= (x_8 - z_8 + \frac{1}{2}) \mathbf{a}_1 + (y_8 - z_8) \mathbf{a}_2 + (x_8 + y_8) \mathbf{a}_3 = a (y_8 - \frac{1}{4}) \hat{\mathbf{x}} + a (x_8 + \frac{1}{4}) \hat{\mathbf{y}} - c (z_8 - \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{72} &= -(x_8 + z_8 - \frac{1}{2}) \mathbf{a}_1 - (y_8 + z_8 - \frac{1}{2}) \mathbf{a}_2 - (x_8 + y_8 - \frac{1}{2}) \mathbf{a}_3 = -a (y_8 - \frac{1}{4}) \hat{\mathbf{x}} - a (x_8 - \frac{1}{4}) \hat{\mathbf{y}} - c (z_8 - \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{73} &= -(y_8 + z_8) \mathbf{a}_1 - (x_8 + z_8) \mathbf{a}_2 - (x_8 + y_8) \mathbf{a}_3 = -ax_8 \hat{\mathbf{x}} - ay_8 \hat{\mathbf{y}} - cz_8 \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{74} &= (y_8 - z_8 + \frac{1}{2}) \mathbf{a}_1 + (x_8 - z_8) \mathbf{a}_2 + (x_8 + y_8 + \frac{1}{2}) \mathbf{a}_3 = ax_8 \hat{\mathbf{x}} + a (y_8 + \frac{1}{2}) \hat{\mathbf{y}} - cz_8 \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{75} &= -(x_8 + z_8) \mathbf{a}_1 + (y_8 - z_8 + \frac{1}{2}) \mathbf{a}_2 - (x_8 - y_8) \mathbf{a}_3 = a (y_8 + \frac{1}{4}) \hat{\mathbf{x}} - a (x_8 + \frac{1}{4}) \hat{\mathbf{y}} - c (z_8 - \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{76} &= (x_8 - z_8) \mathbf{a}_1 - (y_8 + z_8) \mathbf{a}_2 + (x_8 - y_8 + \frac{1}{2}) \mathbf{a}_3 = -a (y_8 - \frac{1}{4}) \hat{\mathbf{x}} + a (x_8 + \frac{1}{4}) \hat{\mathbf{y}} - c (z_8 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{77} &= -(y_8 - z_8) \mathbf{a}_1 + (x_8 + z_8 + \frac{1}{2}) \mathbf{a}_2 + (x_8 - y_8 + \frac{1}{2}) \mathbf{a}_3 = a (x_8 + \frac{1}{2}) \hat{\mathbf{x}} - ay_8 \hat{\mathbf{y}} + cz_8 \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{78} &= (y_8 + z_8 + \frac{1}{2}) \mathbf{a}_1 + (-x_8 + z_8 + \frac{1}{2}) \mathbf{a}_2 - (x_8 - y_8) \mathbf{a}_3 = -ax_8 \hat{\mathbf{x}} + ay_8 \hat{\mathbf{y}} + c (z_8 + \frac{1}{2}) \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{79} &= (-x_8 + z_8 + \frac{1}{2}) \mathbf{a}_1 - (y_8 - z_8) \mathbf{a}_2 - (x_8 + y_8) \mathbf{a}_3 = -a (y_8 + \frac{1}{4}) \hat{\mathbf{x}} - a (x_8 - \frac{1}{4}) \hat{\mathbf{y}} + c (z_8 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Be III} \\
\mathbf{B}_{80} &= (x_8 + z_8 + \frac{1}{2}) \mathbf{a}_1 + (y_8 + z_8 + \frac{1}{2}) \mathbf{a}_2 + (x_8 + y_8 + \frac{1}{2}) \mathbf{a}_3 = a (y_8 + \frac{1}{4}) \hat{\mathbf{x}} + a (x_8 + \frac{1}{4}) \hat{\mathbf{y}} + c (z_8 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Be III}
\end{aligned}$$

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