

Cd₃As₂ Structure:

A2B3_tI160_142_deg_3g-001

This structure previously used the label(s) **A2B3_tI160_142_deg_3g**. Calls to these addresses will be redirected here.

Cite this page as:

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- D. Hicks, M. J. Mehl, M. Esters, C. Oses, 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/1P80>

https://aflow.org/prototype-encyclopedia/A2B3_tI160_142_deg_3g-001

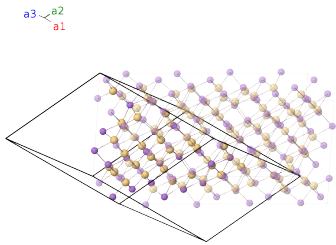
Prototype	As ₂ Cd ₃
AFLOW prototype label	A2B3_tI160_142_deg_3g-001
ICSD	238075
CCDC	427507
Pearson symbol	tI160
Space group number	142
Space group symbol	<i>I</i> 4 ₁ / <i>acd</i>
AFLOW prototype command	<code>aflow --proto=A2B3_tI160_142_deg_3g-001</code> <code>--params=a,c/a,z₁,x₂,x₃,y₃,z₃,x₄,y₄,z₄,x₅,y₅,z₅,x₆,y₆,z₆</code>

Other compounds with this structure

Zn₃As₂

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
B₁	$= \left(z_1 + \frac{1}{4}\right) \mathbf{a}_1 + z_1 \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3$	$=$	$\frac{1}{4}a \hat{\mathbf{y}} + cz_1 \hat{\mathbf{z}}$	(16d)	As I
B₂	$= z_1 \mathbf{a}_1 + \left(z_1 + \frac{1}{4}\right) \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3$	$=$	$\frac{1}{2}a \hat{\mathbf{x}} + \frac{1}{4}a \hat{\mathbf{y}} + c \left(z_1 - \frac{1}{4}\right) \hat{\mathbf{z}}$	(16d)	As I

$$\begin{aligned}
\mathbf{B}_3 &= -\left(z_1 - \frac{1}{4}\right) \mathbf{a}_1 - \left(z_1 - \frac{1}{2}\right) \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3 = \frac{1}{2} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} - cz_1 \hat{\mathbf{z}} & (16d) & \text{As I} \\
\mathbf{B}_4 &= -\left(z_1 - \frac{1}{2}\right) \mathbf{a}_1 - \left(z_1 - \frac{1}{4}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = \frac{1}{4} a \hat{\mathbf{y}} - c\left(z_1 - \frac{1}{4}\right) \hat{\mathbf{z}} & (16d) & \text{As I} \\
\mathbf{B}_5 &= -\left(z_1 - \frac{3}{4}\right) \mathbf{a}_1 - z_1 \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3 = \frac{3}{4} a \hat{\mathbf{y}} - cz_1 \hat{\mathbf{z}} & (16d) & \text{As I} \\
\mathbf{B}_6 &= -z_1 \mathbf{a}_1 - \left(z_1 - \frac{3}{4}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = \frac{1}{2} a \hat{\mathbf{x}} - \frac{1}{4} a \hat{\mathbf{y}} - c\left(z_1 - \frac{1}{4}\right) \hat{\mathbf{z}} & (16d) & \text{As I} \\
\mathbf{B}_7 &= \left(z_1 + \frac{3}{4}\right) \mathbf{a}_1 + \left(z_1 + \frac{1}{2}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = \frac{1}{4} a \hat{\mathbf{y}} + c\left(z_1 + \frac{1}{2}\right) \hat{\mathbf{z}} & (16d) & \text{As I} \\
\mathbf{B}_8 &= \left(z_1 + \frac{1}{2}\right) \mathbf{a}_1 + \left(z_1 + \frac{3}{4}\right) \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3 = \frac{1}{2} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c\left(z_1 + \frac{1}{4}\right) \hat{\mathbf{z}} & (16d) & \text{As I} \\
\mathbf{B}_9 &= \frac{1}{4} \mathbf{a}_1 + \left(x_2 + \frac{1}{4}\right) \mathbf{a}_2 + x_2 \mathbf{a}_3 = ax_2 \hat{\mathbf{x}} + \frac{1}{4} c \hat{\mathbf{z}} & (16e) & \text{As II} \\
\mathbf{B}_{10} &= \frac{3}{4} \mathbf{a}_1 - \left(x_2 - \frac{1}{4}\right) \mathbf{a}_2 - \left(x_2 - \frac{1}{2}\right) \mathbf{a}_3 = -ax_2 \hat{\mathbf{x}} + \frac{1}{2} a \hat{\mathbf{y}} + \frac{1}{4} c \hat{\mathbf{z}} & (16e) & \text{As II} \\
\mathbf{B}_{11} &= \left(x_2 + \frac{1}{4}\right) \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 + x_2 \mathbf{a}_3 = \frac{1}{4} a \hat{\mathbf{x}} + a\left(x_2 - \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{2} c \hat{\mathbf{z}} & (16e) & \text{As II} \\
\mathbf{B}_{12} &= -\left(x_2 - \frac{1}{4}\right) \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 - \left(x_2 - \frac{1}{2}\right) \mathbf{a}_3 = \frac{1}{4} a \hat{\mathbf{x}} - a\left(x_2 - \frac{1}{4}\right) \hat{\mathbf{y}} & (16e) & \text{As II} \\
\mathbf{B}_{13} &= \frac{3}{4} \mathbf{a}_1 - \left(x_2 - \frac{3}{4}\right) \mathbf{a}_2 - x_2 \mathbf{a}_3 = -ax_2 \hat{\mathbf{x}} + \frac{3}{4} c \hat{\mathbf{z}} & (16e) & \text{As II} \\
\mathbf{B}_{14} &= \frac{1}{4} \mathbf{a}_1 + \left(x_2 + \frac{3}{4}\right) \mathbf{a}_2 + \left(x_2 + \frac{1}{2}\right) \mathbf{a}_3 = a\left(x_2 + \frac{1}{2}\right) \hat{\mathbf{x}} + \frac{1}{4} c \hat{\mathbf{z}} & (16e) & \text{As II} \\
\mathbf{B}_{15} &= -\left(x_2 - \frac{3}{4}\right) \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 - x_2 \mathbf{a}_3 = -\frac{1}{4} a \hat{\mathbf{x}} - a\left(x_2 - \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{2} c \hat{\mathbf{z}} & (16e) & \text{As II} \\
\mathbf{B}_{16} &= \left(x_2 + \frac{3}{4}\right) \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 + \left(x_2 + \frac{1}{2}\right) \mathbf{a}_3 = \frac{1}{4} a \hat{\mathbf{x}} + a\left(x_2 + \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{2} c \hat{\mathbf{z}} & (16e) & \text{As II} \\
\mathbf{B}_{17} &= (y_3 + z_3) \mathbf{a}_1 + (x_3 + z_3) \mathbf{a}_2 + (x_3 + y_3) \mathbf{a}_3 = ax_3 \hat{\mathbf{x}} + ay_3 \hat{\mathbf{y}} + cz_3 \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{18} &= \left(-y_3 + z_3 + \frac{1}{2}\right) \mathbf{a}_1 - (x_3 - z_3) \mathbf{a}_2 - \left(x_3 + y_3 - \frac{1}{2}\right) \mathbf{a}_3 = -ax_3 \hat{\mathbf{x}} - a\left(y_3 - \frac{1}{2}\right) \hat{\mathbf{y}} + cz_3 \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{19} &= (x_3 + z_3) \mathbf{a}_1 + \left(-y_3 + z_3 + \frac{1}{2}\right) \mathbf{a}_2 + (x_3 - y_3) \mathbf{a}_3 = -a\left(y_3 - \frac{1}{4}\right) \hat{\mathbf{x}} + a\left(x_3 - \frac{1}{4}\right) \hat{\mathbf{y}} + c\left(z_3 + \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{20} &= -(x_3 - z_3) \mathbf{a}_1 + (y_3 + z_3) \mathbf{a}_2 + \left(-x_3 + y_3 + \frac{1}{2}\right) \mathbf{a}_3 = a\left(y_3 + \frac{1}{4}\right) \hat{\mathbf{x}} - a\left(x_3 - \frac{1}{4}\right) \hat{\mathbf{y}} + c\left(z_3 - \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{21} &= (y_3 - z_3) \mathbf{a}_1 - \left(x_3 + z_3 - \frac{1}{2}\right) \mathbf{a}_2 + \left(-x_3 + y_3 + \frac{1}{2}\right) \mathbf{a}_3 = -a\left(x_3 - \frac{1}{2}\right) \hat{\mathbf{x}} + ay_3 \hat{\mathbf{y}} - cz_3 \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{22} &= -\left(y_3 + z_3 - \frac{1}{2}\right) \mathbf{a}_1 + \left(x_3 - z_3 + \frac{1}{2}\right) \mathbf{a}_2 + (x_3 - y_3) \mathbf{a}_3 = ax_3 \hat{\mathbf{x}} - ay_3 \hat{\mathbf{y}} - c\left(z_3 - \frac{1}{2}\right) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{23} &= \left(x_3 - z_3 + \frac{1}{2}\right) \mathbf{a}_1 + (y_3 - z_3) \mathbf{a}_2 + (x_3 + y_3) \mathbf{a}_3 = a\left(y_3 - \frac{1}{4}\right) \hat{\mathbf{x}} + a\left(x_3 + \frac{1}{4}\right) \hat{\mathbf{y}} - c\left(z_3 - \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{24} &= -\left(x_3 + z_3 - \frac{1}{2}\right) \mathbf{a}_1 - \left(y_3 + z_3 - \frac{1}{2}\right) \mathbf{a}_2 - \left(x_3 + y_3 - \frac{1}{2}\right) \mathbf{a}_3 = -a\left(y_3 - \frac{1}{4}\right) \hat{\mathbf{x}} - a\left(x_3 - \frac{1}{4}\right) \hat{\mathbf{y}} - c\left(z_3 - \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{25} &= -(y_3 + z_3) \mathbf{a}_1 - (x_3 + z_3) \mathbf{a}_2 - (x_3 + y_3) \mathbf{a}_3 = -ax_3 \hat{\mathbf{x}} - ay_3 \hat{\mathbf{y}} - cz_3 \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{26} &= \left(y_3 - z_3 + \frac{1}{2}\right) \mathbf{a}_1 + (x_3 - z_3) \mathbf{a}_2 + \left(x_3 + y_3 + \frac{1}{2}\right) \mathbf{a}_3 = ax_3 \hat{\mathbf{x}} + a\left(y_3 + \frac{1}{2}\right) \hat{\mathbf{y}} - cz_3 \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{27} &= -(x_3 + z_3) \mathbf{a}_1 + \left(y_3 - z_3 + \frac{1}{2}\right) \mathbf{a}_2 - (x_3 - y_3) \mathbf{a}_3 = a\left(y_3 + \frac{1}{4}\right) \hat{\mathbf{x}} - a\left(x_3 + \frac{1}{4}\right) \hat{\mathbf{y}} - c\left(z_3 - \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{28} &= (x_3 - z_3) \mathbf{a}_1 - (y_3 + z_3) \mathbf{a}_2 + \left(x_3 - y_3 + \frac{1}{2}\right) \mathbf{a}_3 = -a\left(y_3 - \frac{1}{4}\right) \hat{\mathbf{x}} + a\left(x_3 + \frac{1}{4}\right) \hat{\mathbf{y}} - c\left(z_3 + \frac{1}{4}\right) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{29} &= -\left(y_3 - z_3\right) \mathbf{a}_1 + \left(x_3 + z_3 + \frac{1}{2}\right) \mathbf{a}_2 + \left(x_3 - y_3 + \frac{1}{2}\right) \mathbf{a}_3 = a\left(x_3 + \frac{1}{2}\right) \hat{\mathbf{x}} - ay_3 \hat{\mathbf{y}} + cz_3 \hat{\mathbf{z}} & (32g) & \text{As III}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{30} &= \begin{pmatrix} (y_3 + z_3 + \frac{1}{2}) \mathbf{a}_1 + \\ (-x_3 + z_3 + \frac{1}{2}) \mathbf{a}_2 - (x_3 - y_3) \mathbf{a}_3 \end{pmatrix} = -ax_3 \hat{\mathbf{x}} + ay_3 \hat{\mathbf{y}} + c(z_3 + \frac{1}{2}) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{31} &= \begin{pmatrix} (-x_3 + z_3 + \frac{1}{2}) \mathbf{a}_1 - \\ (y_3 - z_3) \mathbf{a}_2 - (x_3 + y_3) \mathbf{a}_3 \end{pmatrix} = -a(y_3 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_3 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_3 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{32} &= \begin{pmatrix} (x_3 + z_3 + \frac{1}{2}) \mathbf{a}_1 + \\ (y_3 + z_3 + \frac{1}{2}) \mathbf{a}_2 + \\ (x_3 + y_3 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a(y_3 + \frac{1}{4}) \hat{\mathbf{x}} + a(x_3 + \frac{1}{4}) \hat{\mathbf{y}} + c(z_3 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{As III} \\
\mathbf{B}_{33} &= \begin{pmatrix} (y_4 + z_4) \mathbf{a}_1 + (x_4 + z_4) \mathbf{a}_2 + \\ (x_4 + y_4) \mathbf{a}_3 \end{pmatrix} = ax_4 \hat{\mathbf{x}} + ay_4 \hat{\mathbf{y}} + cz_4 \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{34} &= \begin{pmatrix} (-y_4 + z_4 + \frac{1}{2}) \mathbf{a}_1 - \\ (x_4 - z_4) \mathbf{a}_2 - (x_4 + y_4 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -ax_4 \hat{\mathbf{x}} - a(y_4 - \frac{1}{2}) \hat{\mathbf{y}} + cz_4 \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{35} &= \begin{pmatrix} (x_4 + z_4) \mathbf{a}_1 + \\ (-y_4 + z_4 + \frac{1}{2}) \mathbf{a}_2 + (x_4 - y_4) \mathbf{a}_3 \end{pmatrix} = -a(y_4 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_4 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_4 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{36} &= \begin{pmatrix} -(x_4 - z_4) \mathbf{a}_1 + (y_4 + z_4) \mathbf{a}_2 + \\ (-x_4 + y_4 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a(y_4 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_4 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_4 - \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{37} &= \begin{pmatrix} (y_4 - z_4) \mathbf{a}_1 - (x_4 + z_4 - \frac{1}{2}) \mathbf{a}_2 + \\ (-x_4 + y_4 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(x_4 - \frac{1}{2}) \hat{\mathbf{x}} + ay_4 \hat{\mathbf{y}} - cz_4 \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{38} &= \begin{pmatrix} -(y_4 + z_4 - \frac{1}{2}) \mathbf{a}_1 + \\ (x_4 - z_4 + \frac{1}{2}) \mathbf{a}_2 + (x_4 - y_4) \mathbf{a}_3 \end{pmatrix} = ax_4 \hat{\mathbf{x}} - ay_4 \hat{\mathbf{y}} - c(z_4 - \frac{1}{2}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{39} &= \begin{pmatrix} (x_4 - z_4 + \frac{1}{2}) \mathbf{a}_1 + \\ (y_4 - z_4) \mathbf{a}_2 + (x_4 + y_4) \mathbf{a}_3 \end{pmatrix} = a(y_4 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_4 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_4 - \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{40} &= \begin{pmatrix} -(x_4 + z_4 - \frac{1}{2}) \mathbf{a}_1 - \\ (y_4 + z_4 - \frac{1}{2}) \mathbf{a}_2 - \\ (x_4 + y_4 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(y_4 - \frac{1}{4}) \hat{\mathbf{x}} - a(x_4 - \frac{1}{4}) \hat{\mathbf{y}} - c(z_4 - \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{41} &= \begin{pmatrix} -(y_4 + z_4) \mathbf{a}_1 - (x_4 + z_4) \mathbf{a}_2 - \\ (x_4 + y_4) \mathbf{a}_3 \end{pmatrix} = -ax_4 \hat{\mathbf{x}} - ay_4 \hat{\mathbf{y}} - cz_4 \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{42} &= \begin{pmatrix} (y_4 - z_4 + \frac{1}{2}) \mathbf{a}_1 + \\ (x_4 - z_4) \mathbf{a}_2 + (x_4 + y_4 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = ax_4 \hat{\mathbf{x}} + a(y_4 + \frac{1}{2}) \hat{\mathbf{y}} - cz_4 \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{43} &= \begin{pmatrix} -(x_4 + z_4) \mathbf{a}_1 + \\ (y_4 - z_4 + \frac{1}{2}) \mathbf{a}_2 - (x_4 - y_4) \mathbf{a}_3 \end{pmatrix} = a(y_4 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_4 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_4 - \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{44} &= \begin{pmatrix} (x_4 - z_4) \mathbf{a}_1 - (y_4 + z_4) \mathbf{a}_2 + \\ (x_4 - y_4 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(y_4 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_4 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_4 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{45} &= \begin{pmatrix} -(y_4 - z_4) \mathbf{a}_1 + \\ (x_4 + z_4 + \frac{1}{2}) \mathbf{a}_2 + \\ (x_4 - y_4 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a(x_4 + \frac{1}{2}) \hat{\mathbf{x}} - ay_4 \hat{\mathbf{y}} + cz_4 \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{46} &= \begin{pmatrix} (y_4 + z_4 + \frac{1}{2}) \mathbf{a}_1 + \\ (-x_4 + z_4 + \frac{1}{2}) \mathbf{a}_2 - (x_4 - y_4) \mathbf{a}_3 \end{pmatrix} = -ax_4 \hat{\mathbf{x}} + ay_4 \hat{\mathbf{y}} + c(z_4 + \frac{1}{2}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{47} &= \begin{pmatrix} (-x_4 + z_4 + \frac{1}{2}) \mathbf{a}_1 - \\ (y_4 - z_4) \mathbf{a}_2 - (x_4 + y_4) \mathbf{a}_3 \end{pmatrix} = -a(y_4 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_4 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_4 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{48} &= \begin{pmatrix} (x_4 + z_4 + \frac{1}{2}) \mathbf{a}_1 + \\ (y_4 + z_4 + \frac{1}{2}) \mathbf{a}_2 + \\ (x_4 + y_4 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a(y_4 + \frac{1}{4}) \hat{\mathbf{x}} + a(x_4 + \frac{1}{4}) \hat{\mathbf{y}} + c(z_4 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd I} \\
\mathbf{B}_{49} &= \begin{pmatrix} (y_5 + z_5) \mathbf{a}_1 + (x_5 + z_5) \mathbf{a}_2 + \\ (x_5 + y_5) \mathbf{a}_3 \end{pmatrix} = ax_5 \hat{\mathbf{x}} + ay_5 \hat{\mathbf{y}} + cz_5 \hat{\mathbf{z}} & (32g) & \text{Cd II} \\
\mathbf{B}_{50} &= \begin{pmatrix} (-y_5 + z_5 + \frac{1}{2}) \mathbf{a}_1 - \\ (x_5 - z_5) \mathbf{a}_2 - (x_5 + y_5 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -ax_5 \hat{\mathbf{x}} - a(y_5 - \frac{1}{2}) \hat{\mathbf{y}} + cz_5 \hat{\mathbf{z}} & (32g) & \text{Cd II} \\
\mathbf{B}_{51} &= \begin{pmatrix} (x_5 + z_5) \mathbf{a}_1 + \\ (-y_5 + z_5 + \frac{1}{2}) \mathbf{a}_2 + (x_5 - y_5) \mathbf{a}_3 \end{pmatrix} = -a(y_5 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_5 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_5 + \frac{1}{4}) \hat{\mathbf{z}} & (32g) & \text{Cd II}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{52} &= \begin{aligned} &-(x_5 - z_5) \mathbf{a}_1 + (y_5 + z_5) \mathbf{a}_2 + \\ &(-x_5 + y_5 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &a(y_5 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_5 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_5 - \frac{1}{4}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{53} &= \begin{aligned} &(y_5 - z_5) \mathbf{a}_1 - (x_5 + z_5 - \frac{1}{2}) \mathbf{a}_2 + \\ &(-x_5 + y_5 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &-a(x_5 - \frac{1}{2}) \hat{\mathbf{x}} + ay_5 \hat{\mathbf{y}} - cz_5 \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{54} &= \begin{aligned} &-(y_5 + z_5 - \frac{1}{2}) \mathbf{a}_1 + \\ &(x_5 - z_5 + \frac{1}{2}) \mathbf{a}_2 + (x_5 - y_5) \mathbf{a}_3 \end{aligned} &= &ax_5 \hat{\mathbf{x}} - ay_5 \hat{\mathbf{y}} - c(z_5 - \frac{1}{2}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{55} &= \begin{aligned} &(x_5 - z_5 + \frac{1}{2}) \mathbf{a}_1 + \\ &(y_5 - z_5) \mathbf{a}_2 + (x_5 + y_5) \mathbf{a}_3 \end{aligned} &= &a(y_5 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_5 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_5 - \frac{1}{4}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{56} &= \begin{aligned} &-(x_5 + z_5 - \frac{1}{2}) \mathbf{a}_1 - \\ &(y_5 + z_5 - \frac{1}{2}) \mathbf{a}_2 - \\ &(x_5 + y_5 - \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &-a(y_5 - \frac{1}{4}) \hat{\mathbf{x}} - a(x_5 - \frac{1}{4}) \hat{\mathbf{y}} - c(z_5 - \frac{1}{4}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{57} &= \begin{aligned} &-(y_5 + z_5) \mathbf{a}_1 - (x_5 + z_5) \mathbf{a}_2 - \\ &(x_5 + y_5) \mathbf{a}_3 \end{aligned} &= &-ax_5 \hat{\mathbf{x}} - ay_5 \hat{\mathbf{y}} - cz_5 \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{58} &= \begin{aligned} &(y_5 - z_5 + \frac{1}{2}) \mathbf{a}_1 + \\ &(x_5 - z_5) \mathbf{a}_2 + (x_5 + y_5 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &ax_5 \hat{\mathbf{x}} + a(y_5 + \frac{1}{2}) \hat{\mathbf{y}} - cz_5 \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{59} &= \begin{aligned} &-(x_5 + z_5) \mathbf{a}_1 + \\ &(y_5 - z_5 + \frac{1}{2}) \mathbf{a}_2 - (x_5 - y_5) \mathbf{a}_3 \end{aligned} &= &a(y_5 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_5 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_5 - \frac{1}{4}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{60} &= \begin{aligned} &(x_5 - z_5) \mathbf{a}_1 - (y_5 + z_5) \mathbf{a}_2 + \\ &(x_5 - y_5 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &-a(y_5 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_5 + \frac{1}{4}) \hat{\mathbf{y}} - c(z_5 + \frac{1}{4}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{61} &= \begin{aligned} &-(y_5 - z_5) \mathbf{a}_1 + \\ &(x_5 + z_5 + \frac{1}{2}) \mathbf{a}_2 + \\ &(x_5 - y_5 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &a(x_5 + \frac{1}{2}) \hat{\mathbf{x}} - ay_5 \hat{\mathbf{y}} + cz_5 \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{62} &= \begin{aligned} &(y_5 + z_5 + \frac{1}{2}) \mathbf{a}_1 + \\ &(-x_5 + z_5 + \frac{1}{2}) \mathbf{a}_2 - (x_5 - y_5) \mathbf{a}_3 \end{aligned} &= &-ax_5 \hat{\mathbf{x}} + ay_5 \hat{\mathbf{y}} + c(z_5 + \frac{1}{2}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{63} &= \begin{aligned} &(-x_5 + z_5 + \frac{1}{2}) \mathbf{a}_1 - \\ &(y_5 - z_5) \mathbf{a}_2 - (x_5 + y_5) \mathbf{a}_3 \end{aligned} &= &-a(y_5 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_5 - \frac{1}{4}) \hat{\mathbf{y}} + c(z_5 + \frac{1}{4}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{64} &= \begin{aligned} &(x_5 + z_5 + \frac{1}{2}) \mathbf{a}_1 + \\ &(y_5 + z_5 + \frac{1}{2}) \mathbf{a}_2 + \\ &(x_5 + y_5 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &a(y_5 + \frac{1}{4}) \hat{\mathbf{x}} + a(x_5 + \frac{1}{4}) \hat{\mathbf{y}} + c(z_5 + \frac{1}{4}) \hat{\mathbf{z}} &(32g) &\text{Cd II} \\
\mathbf{B}_{65} &= \begin{aligned} &(y_6 + z_6) \mathbf{a}_1 + (x_6 + z_6) \mathbf{a}_2 + \\ &(x_6 + y_6) \mathbf{a}_3 \end{aligned} &= &ax_6 \hat{\mathbf{x}} + ay_6 \hat{\mathbf{y}} + cz_6 \hat{\mathbf{z}} &(32g) &\text{Cd III} \\
\mathbf{B}_{66} &= \begin{aligned} &(-y_6 + z_6 + \frac{1}{2}) \mathbf{a}_1 - \\ &(x_6 - z_6) \mathbf{a}_2 - (x_6 + y_6 - \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &-ax_6 \hat{\mathbf{x}} - a(y_6 - \frac{1}{2}) \hat{\mathbf{y}} + cz_6 \hat{\mathbf{z}} &(32g) &\text{Cd III} \\
\mathbf{B}_{67} &= \begin{aligned} &(x_6 + z_6) \mathbf{a}_1 + \\ &(-y_6 + z_6 + \frac{1}{2}) \mathbf{a}_2 + (x_6 - y_6) \mathbf{a}_3 \end{aligned} &= &-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) &\text{Cd III} \\
\mathbf{B}_{68} &= \begin{aligned} &-(x_6 - z_6) \mathbf{a}_1 + (y_6 + z_6) \mathbf{a}_2 + \\ &(-x_6 + y_6 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &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) &\text{Cd III} \\
\mathbf{B}_{69} &= \begin{aligned} &(y_6 - z_6) \mathbf{a}_1 - (x_6 + z_6 - \frac{1}{2}) \mathbf{a}_2 + \\ &(-x_6 + y_6 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &-a(x_6 - \frac{1}{2}) \hat{\mathbf{x}} + ay_6 \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}} &(32g) &\text{Cd III} \\
\mathbf{B}_{70} &= \begin{aligned} &-(y_6 + z_6 - \frac{1}{2}) \mathbf{a}_1 + \\ &(x_6 - z_6 + \frac{1}{2}) \mathbf{a}_2 + (x_6 - y_6) \mathbf{a}_3 \end{aligned} &= &ax_6 \hat{\mathbf{x}} - ay_6 \hat{\mathbf{y}} - c(z_6 - \frac{1}{2}) \hat{\mathbf{z}} &(32g) &\text{Cd III} \\
\mathbf{B}_{71} &= \begin{aligned} &(x_6 - z_6 + \frac{1}{2}) \mathbf{a}_1 + \\ &(y_6 - z_6) \mathbf{a}_2 + (x_6 + y_6) \mathbf{a}_3 \end{aligned} &= &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) &\text{Cd III} \\
\mathbf{B}_{72} &= \begin{aligned} &-(x_6 + z_6 - \frac{1}{2}) \mathbf{a}_1 - \\ &(y_6 + z_6 - \frac{1}{2}) \mathbf{a}_2 - \\ &(x_6 + y_6 - \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= &-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) &\text{Cd III} \\
\mathbf{B}_{73} &= \begin{aligned} &-(y_6 + z_6) \mathbf{a}_1 - (x_6 + z_6) \mathbf{a}_2 - \\ &(x_6 + y_6) \mathbf{a}_3 \end{aligned} &= &-ax_6 \hat{\mathbf{x}} - ay_6 \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}} &(32g) &\text{Cd III}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{74} &= \begin{pmatrix} y_6 - z_6 + \frac{1}{2} \\ x_6 - z_6 \end{pmatrix} \mathbf{a}_1 + \begin{pmatrix} x_6 + y_6 + \frac{1}{2} \\ x_6 - z_6 \end{pmatrix} \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{Cd III} \\
\mathbf{B}_{75} &= \begin{pmatrix} -(x_6 + z_6) \\ y_6 - z_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_1 + \begin{pmatrix} x_6 + y_6 + \frac{1}{2} \\ y_6 - z_6 + \frac{1}{2} \end{pmatrix} \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{Cd III} \\
\mathbf{B}_{76} &= \begin{pmatrix} x_6 - z_6 \\ x_6 - y_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_1 - \begin{pmatrix} y_6 + z_6 \\ x_6 - y_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_2 + \begin{pmatrix} x_6 + y_6 + \frac{1}{2} \\ x_6 - y_6 + \frac{1}{2} \end{pmatrix} \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{Cd III} \\
\mathbf{B}_{77} &= \begin{pmatrix} -(y_6 - z_6) \\ x_6 + z_6 + \frac{1}{2} \\ x_6 - y_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_1 + \begin{pmatrix} x_6 + z_6 + \frac{1}{2} \\ x_6 - y_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_2 + \begin{pmatrix} x_6 + y_6 + \frac{1}{2} \\ x_6 - y_6 + \frac{1}{2} \end{pmatrix} \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{Cd III} \\
\mathbf{B}_{78} &= \begin{pmatrix} y_6 + z_6 + \frac{1}{2} \\ -x_6 + z_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_1 + \begin{pmatrix} x_6 + y_6 + \frac{1}{2} \\ -x_6 + z_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_2 - \begin{pmatrix} x_6 - y_6 \\ -x_6 + z_6 + \frac{1}{2} \end{pmatrix} \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{Cd III} \\
\mathbf{B}_{79} &= \begin{pmatrix} -x_6 + z_6 + \frac{1}{2} \\ y_6 - z_6 \end{pmatrix} \mathbf{a}_1 - \begin{pmatrix} x_6 + y_6 + \frac{1}{2} \\ y_6 - z_6 \end{pmatrix} \mathbf{a}_2 - \begin{pmatrix} x_6 + y_6 \\ y_6 - z_6 \end{pmatrix} \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{Cd III} \\
\mathbf{B}_{80} &= \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 + \begin{pmatrix} x_6 + z_6 + \frac{1}{2} \\ y_6 + z_6 + \frac{1}{2} \end{pmatrix} \mathbf{a}_2 + \begin{pmatrix} x_6 + y_6 + \frac{1}{2} \\ y_6 + z_6 + \frac{1}{2} \end{pmatrix} \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{Cd III}
\end{aligned}$$

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