

La₃Rh₄Sn₁₃ Structure:

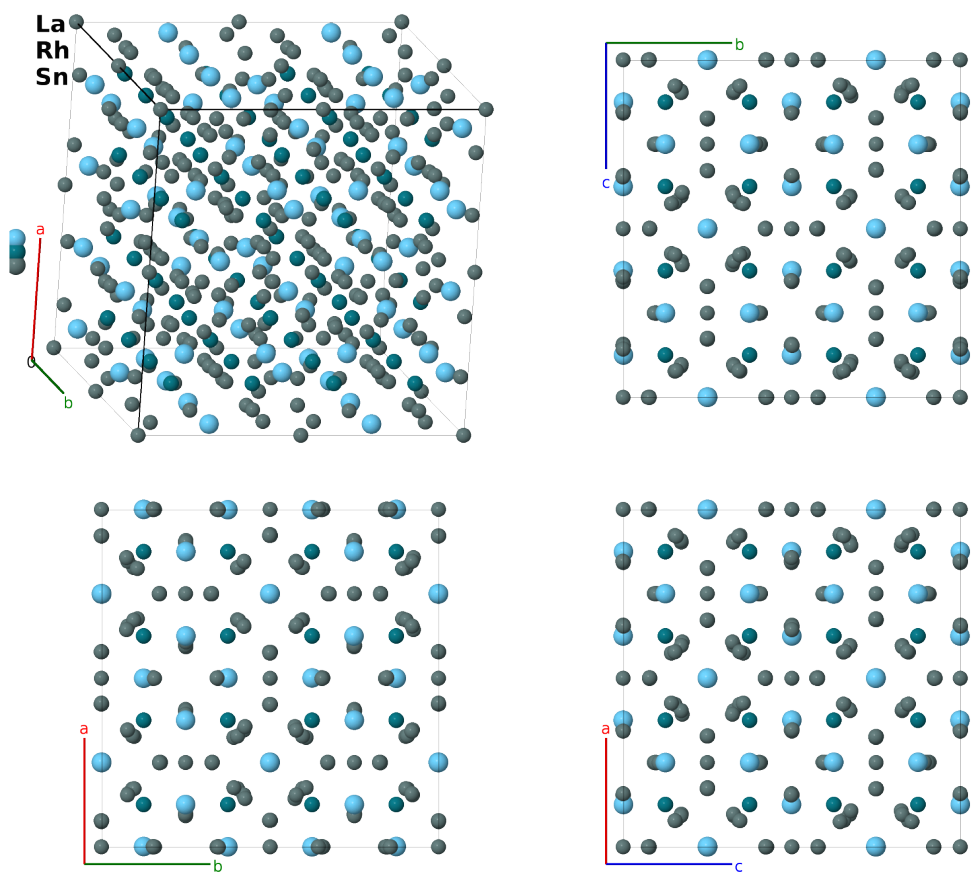
A3B4C13_cI320_214_gh_abgh_e4i-001

Cite this page as:

- H. Eckert, S. Divilov, M. J. Mehl, D. Hicks, A. C. Zettel, M. Esters, X. Campilongo, and S. Curtarolo, *The AFLOW Library of Crystallographic Prototypes: Part 4*, Comput. Mater. Sci. **240**, 112988 (2024), doi: 10.1016/j.commatsci.2024.112988.
- 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/1DPD>

https://aflow.org/prototype-encyclopedia/A3B4C13_cI320_214_gh_abgh_e4i-001



Prototype	La ₃ Rh ₄ Sn ₁₃
AFLOW prototype label	A3B4C13_cI320_214_gh_abgh_e4i-001
ICSD	54367
CCDC	1618939
Pearson symbol	cI320
Space group number	214
Space group symbol	$I4_132$
AFLOW prototype command	<pre>aflow --proto=A3B4C13_cI320_214_gh_abgh_e4i-001 --params=a, x₃, y₄, y₅, y₆, y₇, x₈, y₈, z₈, x₉, y₉, z₉, x₁₀, y₁₀, z₁₀, x₁₁, y₁₁, z₁₁</pre>

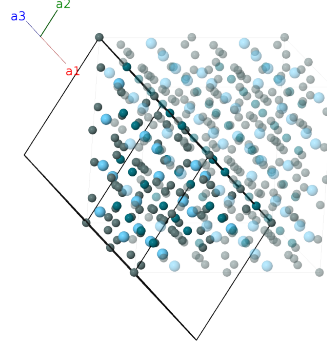
Other compounds with this structure

$\text{Ca}_3\text{Rh}_4\text{Sn}_{13}$, $\text{Ce}_3\text{Rh}_4\text{Sn}_{13}$, $\text{Gd}_3\text{Rh}_4\text{Sn}_{13}$, $\text{Nd}_3\text{Rh}_4\text{Sn}_{13}$, $\text{Pr}_3\text{Rh}_4\text{Sn}_{13}$, $\text{Sm}_3\text{Rh}_4\text{Sn}_{13}$, $\text{Tb}_3\text{Rh}_4\text{Sn}_{13}$, $\text{Th}_3\text{Rh}_4\text{Sn}_{13}$, $\text{Yb}_3\text{Rh}_4\text{Sn}_{13}$

- (Bordet, 1991) refers to this as the “phase I” structure of materials with the formula $\text{M}_3\text{Rh}_4\text{Sn}_{13}$, with the “phase I” structure represented by the centrosymmetric $\text{Yb}_3\text{Rh}_4\text{Sn}_{13}$ phase.
- (Villars, 2016) calls this the high-temperature phase of $\text{La}_3\text{Rh}_4\text{Sn}_{13}$.

Body-centered Cubic primitive vectors

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



Basis vectors

	Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B}_1$	$= \frac{1}{4}\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 + \frac{1}{4}\mathbf{a}_3$	$=$	$\frac{1}{8}a\hat{\mathbf{x}} + \frac{1}{8}a\hat{\mathbf{y}} + \frac{1}{8}a\hat{\mathbf{z}}$	(8a)	Rh I
$\mathbf{B}_2$	$= \frac{1}{2}\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_3$	$=$	$-\frac{1}{8}a\hat{\mathbf{x}} + \frac{3}{8}a\hat{\mathbf{y}} + \frac{1}{8}a\hat{\mathbf{z}}$	(8a)	Rh I
$\mathbf{B}_3$	$= \frac{1}{4}\mathbf{a}_2 + \frac{1}{2}\mathbf{a}_3$	$=$	$\frac{3}{8}a\hat{\mathbf{x}} + \frac{1}{8}a\hat{\mathbf{y}} - \frac{1}{8}a\hat{\mathbf{z}}$	(8a)	Rh I
$\mathbf{B}_4$	$= \frac{1}{4}\mathbf{a}_1 + \frac{1}{2}\mathbf{a}_2$	$=$	$\frac{1}{8}a\hat{\mathbf{x}} - \frac{1}{8}a\hat{\mathbf{y}} + \frac{3}{8}a\hat{\mathbf{z}}$	(8a)	Rh I
$\mathbf{B}_5$	$= \frac{3}{4}\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 + \frac{3}{4}\mathbf{a}_3$	$=$	$\frac{3}{8}a\hat{\mathbf{x}} + \frac{3}{8}a\hat{\mathbf{y}} + \frac{3}{8}a\hat{\mathbf{z}}$	(8b)	Rh II
$\mathbf{B}_6$	$= \frac{1}{2}\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_3$	$=$	$\frac{1}{8}a\hat{\mathbf{x}} + \frac{5}{8}a\hat{\mathbf{y}} - \frac{1}{8}a\hat{\mathbf{z}}$	(8b)	Rh II
$\mathbf{B}_7$	$= \frac{3}{4}\mathbf{a}_2 + \frac{1}{2}\mathbf{a}_3$	$=$	$\frac{5}{8}a\hat{\mathbf{x}} - \frac{1}{8}a\hat{\mathbf{y}} + \frac{1}{8}a\hat{\mathbf{z}}$	(8b)	Rh II
$\mathbf{B}_8$	$= \frac{3}{4}\mathbf{a}_1 + \frac{1}{2}\mathbf{a}_2$	$=$	$-\frac{1}{8}a\hat{\mathbf{x}} + \frac{1}{8}a\hat{\mathbf{y}} + \frac{5}{8}a\hat{\mathbf{z}}$	(8b)	Rh II
$\mathbf{B}_9$	$= 2x_3\mathbf{a}_1 + 2x_3\mathbf{a}_2 + 2x_3\mathbf{a}_3$	$=$	$ax_3\hat{\mathbf{x}} + ax_3\hat{\mathbf{y}} + ax_3\hat{\mathbf{z}}$	(16e)	Sn I
$\mathbf{B}_{10}$	$= \frac{1}{2}\mathbf{a}_1 - (2x_3 - \frac{1}{2})\mathbf{a}_3$	$=$	$-ax_3\hat{\mathbf{x}} - a(x_3 - \frac{1}{2})\hat{\mathbf{y}} + ax_3\hat{\mathbf{z}}$	(16e)	Sn I
$\mathbf{B}_{11}$	$= -(2x_3 - \frac{1}{2})\mathbf{a}_2 + \frac{1}{2}\mathbf{a}_3$	$=$	$-a(x_3 - \frac{1}{2})\hat{\mathbf{x}} + ax_3\hat{\mathbf{y}} - ax_3\hat{\mathbf{z}}$	(16e)	Sn I
$\mathbf{B}_{12}$	$= -(2x_3 - \frac{1}{2})\mathbf{a}_1 + \frac{1}{2}\mathbf{a}_2$	$=$	$ax_3\hat{\mathbf{x}} - ax_3\hat{\mathbf{y}} - a(x_3 - \frac{1}{2})\hat{\mathbf{z}}$	(16e)	Sn I
$\mathbf{B}_{13}$	$= \frac{1}{2}\mathbf{a}_1 + 2x_3\mathbf{a}_3$	$=$	$a(x_3 - \frac{1}{4})\hat{\mathbf{x}} + a(x_3 + \frac{1}{4})\hat{\mathbf{y}} - a(x_3 - \frac{1}{4})\hat{\mathbf{z}}$	(16e)	Sn I
$\mathbf{B}_{14}$	$= -(2x_3 - \frac{1}{2})\mathbf{a}_1 - (2x_3 - \frac{1}{2})\mathbf{a}_2 - (2x_3 - \frac{1}{2})\mathbf{a}_3$	$=$	$-a(x_3 - \frac{1}{4})\hat{\mathbf{x}} - a(x_3 - \frac{1}{4})\hat{\mathbf{y}} - a(x_3 - \frac{1}{4})\hat{\mathbf{z}}$	(16e)	Sn I
$\mathbf{B}_{15}$	$= 2x_3\mathbf{a}_2 + \frac{1}{2}\mathbf{a}_3$	$=$	$a(x_3 + \frac{1}{4})\hat{\mathbf{x}} - a(x_3 - \frac{1}{4})\hat{\mathbf{y}} + a(x_3 - \frac{1}{4})\hat{\mathbf{z}}$	(16e)	Sn I
$\mathbf{B}_{16}$	$= 2x_3\mathbf{a}_1 + \frac{1}{2}\mathbf{a}_2$	$=$	$-a(x_3 - \frac{1}{4})\hat{\mathbf{x}} + a(x_3 - \frac{1}{4})\hat{\mathbf{y}} + a(x_3 + \frac{1}{4})\hat{\mathbf{z}}$	(16e)	Sn I
$\mathbf{B}_{17}$	$= (2y_4 + \frac{1}{4})\mathbf{a}_1 + (y_4 + \frac{3}{8})\mathbf{a}_2 + (y_4 + \frac{1}{8})\mathbf{a}_3$	$=$	$\frac{1}{8}a\hat{\mathbf{x}} + ay_4\hat{\mathbf{y}} + a(y_4 + \frac{1}{4})\hat{\mathbf{z}}$	(24g)	La I
$\mathbf{B}_{18}$	$= \frac{3}{4}\mathbf{a}_1 + (y_4 + \frac{1}{8})\mathbf{a}_2 - (y_4 - \frac{3}{8})\mathbf{a}_3$	$=$	$-\frac{1}{8}a\hat{\mathbf{x}} - a(y_4 - \frac{1}{2})\hat{\mathbf{y}} + a(y_4 + \frac{1}{4})\hat{\mathbf{z}}$	(24g)	La I
$\mathbf{B}_{19}$	$= \frac{3}{4}\mathbf{a}_1 - (y_4 - \frac{1}{8})\mathbf{a}_2 + (y_4 + \frac{3}{8})\mathbf{a}_3$	$=$	$-\frac{1}{8}a\hat{\mathbf{x}} + a(y_4 + \frac{1}{2})\hat{\mathbf{y}} - a(y_4 - \frac{1}{4})\hat{\mathbf{z}}$	(24g)	La I

$\mathbf{B}_{20}$	$=$	$-(2y_4 - \frac{1}{4}) \mathbf{a}_1 - (y_4 - \frac{3}{8}) \mathbf{a}_2 -$	$=$	$\frac{1}{8}a \hat{\mathbf{x}} - ay_4 \hat{\mathbf{y}} - a(y_4 - \frac{1}{4}) \hat{\mathbf{z}}$	(24g)	La I
		$(y_4 - \frac{1}{8}) \mathbf{a}_3$				
$\mathbf{B}_{21}$	$=$	$(y_4 + \frac{1}{8}) \mathbf{a}_1 + (2y_4 + \frac{1}{4}) \mathbf{a}_2 +$	$=$	$a(y_4 + \frac{1}{4}) \hat{\mathbf{x}} + \frac{1}{8}a \hat{\mathbf{y}} + ay_4 \hat{\mathbf{z}}$	(24g)	La I
		$(y_4 + \frac{3}{8}) \mathbf{a}_3$				
$\mathbf{B}_{22}$	$=$	$-(y_4 - \frac{3}{8}) \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 +$	$=$	$a(y_4 + \frac{1}{4}) \hat{\mathbf{x}} - \frac{1}{8}a \hat{\mathbf{y}} - a(y_4 - \frac{1}{2}) \hat{\mathbf{z}}$	(24g)	La I
		$(y_4 + \frac{1}{8}) \mathbf{a}_3$				
$\mathbf{B}_{23}$	$=$	$(y_4 + \frac{3}{8}) \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - (y_4 - \frac{1}{8}) \mathbf{a}_3$	$=$	$-a(y_4 - \frac{1}{4}) \hat{\mathbf{x}} - \frac{1}{8}a \hat{\mathbf{y}} + a(y_4 + \frac{1}{2}) \hat{\mathbf{z}}$	(24g)	La I
$\mathbf{B}_{24}$	$=$	$-(y_4 - \frac{1}{8}) \mathbf{a}_1 - (2y_4 - \frac{1}{4}) \mathbf{a}_2 -$	$=$	$-a(y_4 - \frac{1}{4}) \hat{\mathbf{x}} + \frac{1}{8}a \hat{\mathbf{y}} - ay_4 \hat{\mathbf{z}}$	(24g)	La I
		$(y_4 - \frac{3}{8}) \mathbf{a}_3$				
$\mathbf{B}_{25}$	$=$	$(y_4 + \frac{3}{8}) \mathbf{a}_1 + (y_4 + \frac{1}{8}) \mathbf{a}_2 +$	$=$	$ay_4 \hat{\mathbf{x}} + a(y_4 + \frac{1}{4}) \hat{\mathbf{y}} + \frac{1}{8}a \hat{\mathbf{z}}$	(24g)	La I
		$(2y_4 + \frac{1}{4}) \mathbf{a}_3$				
$\mathbf{B}_{26}$	$=$	$(y_4 + \frac{1}{8}) \mathbf{a}_1 - (y_4 - \frac{3}{8}) \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3$	$=$	$-a(y_4 - \frac{1}{2}) \hat{\mathbf{x}} + a(y_4 + \frac{1}{4}) \hat{\mathbf{y}} - \frac{1}{8}a \hat{\mathbf{z}}$	(24g)	La I
$\mathbf{B}_{27}$	$=$	$-(y_4 - \frac{1}{8}) \mathbf{a}_1 + (y_4 + \frac{3}{8}) \mathbf{a}_2 +$	$=$	$a(y_4 + \frac{1}{2}) \hat{\mathbf{x}} - a(y_4 - \frac{1}{4}) \hat{\mathbf{y}} - \frac{1}{8}a \hat{\mathbf{z}}$	(24g)	La I
		$\frac{3}{4} \mathbf{a}_3$				
$\mathbf{B}_{28}$	$=$	$-(y_4 - \frac{3}{8}) \mathbf{a}_1 - (y_4 - \frac{1}{8}) \mathbf{a}_2 -$	$=$	$-ay_4 \hat{\mathbf{x}} - a(y_4 - \frac{1}{4}) \hat{\mathbf{y}} + \frac{1}{8}a \hat{\mathbf{z}}$	(24g)	La I
		$(2y_4 - \frac{1}{4}) \mathbf{a}_3$				
$\mathbf{B}_{29}$	$=$	$(2y_5 + \frac{1}{4}) \mathbf{a}_1 + (y_5 + \frac{3}{8}) \mathbf{a}_2 +$	$=$	$\frac{1}{8}a \hat{\mathbf{x}} + ay_5 \hat{\mathbf{y}} + a(y_5 + \frac{1}{4}) \hat{\mathbf{z}}$	(24g)	Rh III
		$(y_5 + \frac{1}{8}) \mathbf{a}_3$				
$\mathbf{B}_{30}$	$=$	$\frac{3}{4} \mathbf{a}_1 + (y_5 + \frac{1}{8}) \mathbf{a}_2 - (y_5 - \frac{3}{8}) \mathbf{a}_3$	$=$	$-\frac{1}{8}a \hat{\mathbf{x}} - a(y_5 - \frac{1}{2}) \hat{\mathbf{y}} + a(y_5 + \frac{1}{4}) \hat{\mathbf{z}}$	(24g)	Rh III
$\mathbf{B}_{31}$	$=$	$\frac{3}{4} \mathbf{a}_1 - (y_5 - \frac{1}{8}) \mathbf{a}_2 + (y_5 + \frac{3}{8}) \mathbf{a}_3$	$=$	$-\frac{1}{8}a \hat{\mathbf{x}} + a(y_5 + \frac{1}{2}) \hat{\mathbf{y}} - a(y_5 - \frac{1}{4}) \hat{\mathbf{z}}$	(24g)	Rh III
$\mathbf{B}_{32}$	$=$	$-(2y_5 - \frac{1}{4}) \mathbf{a}_1 - (y_5 - \frac{3}{8}) \mathbf{a}_2 -$	$=$	$\frac{1}{8}a \hat{\mathbf{x}} - ay_5 \hat{\mathbf{y}} - a(y_5 - \frac{1}{4}) \hat{\mathbf{z}}$	(24g)	Rh III
		$(y_5 - \frac{1}{8}) \mathbf{a}_3$				
$\mathbf{B}_{33}$	$=$	$(y_5 + \frac{1}{8}) \mathbf{a}_1 + (2y_5 + \frac{1}{4}) \mathbf{a}_2 +$	$=$	$a(y_5 + \frac{1}{4}) \hat{\mathbf{x}} + \frac{1}{8}a \hat{\mathbf{y}} + ay_5 \hat{\mathbf{z}}$	(24g)	Rh III
		$(y_5 + \frac{3}{8}) \mathbf{a}_3$				
$\mathbf{B}_{34}$	$=$	$-(y_5 - \frac{3}{8}) \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 +$	$=$	$a(y_5 + \frac{1}{4}) \hat{\mathbf{x}} - \frac{1}{8}a \hat{\mathbf{y}} - a(y_5 - \frac{1}{2}) \hat{\mathbf{z}}$	(24g)	Rh III
		$(y_5 + \frac{1}{8}) \mathbf{a}_3$				
$\mathbf{B}_{35}$	$=$	$(y_5 + \frac{3}{8}) \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - (y_5 - \frac{1}{8}) \mathbf{a}_3$	$=$	$-a(y_5 - \frac{1}{4}) \hat{\mathbf{x}} - \frac{1}{8}a \hat{\mathbf{y}} + a(y_5 + \frac{1}{2}) \hat{\mathbf{z}}$	(24g)	Rh III
$\mathbf{B}_{36}$	$=$	$-(y_5 - \frac{1}{8}) \mathbf{a}_1 - (2y_5 - \frac{1}{4}) \mathbf{a}_2 -$	$=$	$-a(y_5 - \frac{1}{4}) \hat{\mathbf{x}} + \frac{1}{8}a \hat{\mathbf{y}} - ay_5 \hat{\mathbf{z}}$	(24g)	Rh III
		$(y_5 - \frac{3}{8}) \mathbf{a}_3$				
$\mathbf{B}_{37}$	$=$	$(y_5 + \frac{3}{8}) \mathbf{a}_1 + (y_5 + \frac{1}{8}) \mathbf{a}_2 +$	$=$	$ay_5 \hat{\mathbf{x}} + a(y_5 + \frac{1}{4}) \hat{\mathbf{y}} + \frac{1}{8}a \hat{\mathbf{z}}$	(24g)	Rh III
		$(2y_5 + \frac{1}{4}) \mathbf{a}_3$				
$\mathbf{B}_{38}$	$=$	$(y_5 + \frac{1}{8}) \mathbf{a}_1 - (y_5 - \frac{3}{8}) \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3$	$=$	$-a(y_5 - \frac{1}{2}) \hat{\mathbf{x}} + a(y_5 + \frac{1}{4}) \hat{\mathbf{y}} - \frac{1}{8}a \hat{\mathbf{z}}$	(24g)	Rh III
$\mathbf{B}_{39}$	$=$	$-(y_5 - \frac{1}{8}) \mathbf{a}_1 + (y_5 + \frac{3}{8}) \mathbf{a}_2 +$	$=$	$a(y_5 + \frac{1}{2}) \hat{\mathbf{x}} - a(y_5 - \frac{1}{4}) \hat{\mathbf{y}} - \frac{1}{8}a \hat{\mathbf{z}}$	(24g)	Rh III

$$\begin{aligned}
\mathbf{B}_{47} &= \begin{pmatrix} (y_6 + \frac{3}{8}) \mathbf{a}_1 + (2y_6 + \frac{3}{4}) \mathbf{a}_2 + \\ (y_6 + \frac{1}{8}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_6 + \frac{1}{4}) \hat{\mathbf{x}} - \frac{1}{8}a \hat{\mathbf{y}} + a (y_6 + \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{La II} \\
\mathbf{B}_{48} &= \begin{pmatrix} -(y_6 - \frac{1}{8}) \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + \\ (y_6 + \frac{3}{8}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_6 + \frac{1}{4}) \hat{\mathbf{x}} + \frac{1}{8}a \hat{\mathbf{y}} - ay_6 \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{La II} \\
\mathbf{B}_{49} &= \begin{pmatrix} -(y_6 - \frac{3}{8}) \mathbf{a}_1 + (y_6 + \frac{1}{8}) \mathbf{a}_2 + \\ \frac{1}{4} \mathbf{a}_3 \end{pmatrix} = ay_6 \hat{\mathbf{x}} - a \begin{pmatrix} (y_6 - \frac{1}{4}) \hat{\mathbf{y}} + \frac{1}{8}a \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{La II} \\
\mathbf{B}_{50} &= \begin{pmatrix} -(y_6 - \frac{1}{8}) \mathbf{a}_1 - (y_6 - \frac{3}{8}) \mathbf{a}_2 - \\ (2y_6 - \frac{3}{4}) \mathbf{a}_3 \end{pmatrix} = -a \begin{pmatrix} (y_6 - \frac{1}{2}) \hat{\mathbf{x}} - a (y_6 - \frac{1}{4}) \hat{\mathbf{y}} - \frac{1}{8}a \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{La II} \\
\mathbf{B}_{51} &= \begin{pmatrix} (y_6 + \frac{1}{8}) \mathbf{a}_1 + (y_6 + \frac{3}{8}) \mathbf{a}_2 + \\ (2y_6 + \frac{3}{4}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_6 + \frac{1}{2}) \hat{\mathbf{x}} + a (y_6 + \frac{1}{4}) \hat{\mathbf{y}} - \frac{1}{8}a \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{La II} \\
\mathbf{B}_{52} &= (y_6 + \frac{3}{8}) \mathbf{a}_1 - (y_6 - \frac{1}{8}) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = -ay_6 \hat{\mathbf{x}} + a \begin{pmatrix} (y_6 + \frac{1}{4}) \hat{\mathbf{y}} + \frac{1}{8}a \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{La II} \\
\mathbf{B}_{53} &= \frac{1}{4} \mathbf{a}_1 - (y_7 - \frac{3}{8}) \mathbf{a}_2 + (y_7 + \frac{1}{8}) \mathbf{a}_3 = \frac{1}{8}a \hat{\mathbf{x}} + ay_7 \hat{\mathbf{y}} - a \begin{pmatrix} (y_7 - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{54} &= \begin{pmatrix} -(2y_7 - \frac{3}{4}) \mathbf{a}_1 - (y_7 - \frac{1}{8}) \mathbf{a}_2 - \\ (y_7 - \frac{3}{8}) \mathbf{a}_3 \end{pmatrix} = -\frac{1}{8}a \hat{\mathbf{x}} - a \begin{pmatrix} (y_7 - \frac{1}{2}) \hat{\mathbf{y}} - a (y_7 - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{55} &= \begin{pmatrix} (2y_7 + \frac{3}{4}) \mathbf{a}_1 + (y_7 + \frac{1}{8}) \mathbf{a}_2 + \\ (y_7 + \frac{3}{8}) \mathbf{a}_3 \end{pmatrix} = -\frac{1}{8}a \hat{\mathbf{x}} + a \begin{pmatrix} (y_7 + \frac{1}{2}) \hat{\mathbf{y}} + a (y_7 + \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{56} &= \frac{1}{4} \mathbf{a}_1 + (y_7 + \frac{3}{8}) \mathbf{a}_2 - (y_7 - \frac{1}{8}) \mathbf{a}_3 = \frac{1}{8}a \hat{\mathbf{x}} - ay_7 \hat{\mathbf{y}} + a \begin{pmatrix} (y_7 + \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{57} &= (y_7 + \frac{1}{8}) \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 - (y_7 - \frac{3}{8}) \mathbf{a}_3 = -a \begin{pmatrix} (y_7 - \frac{1}{4}) \hat{\mathbf{x}} + \frac{1}{8}a \hat{\mathbf{y}} + ay_7 \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{58} &= \begin{pmatrix} -(y_7 - \frac{3}{8}) \mathbf{a}_1 - (2y_7 - \frac{3}{4}) \mathbf{a}_2 - \\ (y_7 - \frac{1}{8}) \mathbf{a}_3 \end{pmatrix} = -a \begin{pmatrix} (y_7 - \frac{1}{4}) \hat{\mathbf{x}} - \frac{1}{8}a \hat{\mathbf{y}} - a (y_7 - \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{59} &= \begin{pmatrix} (y_7 + \frac{3}{8}) \mathbf{a}_1 + (2y_7 + \frac{3}{4}) \mathbf{a}_2 + \\ (y_7 + \frac{1}{8}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_7 + \frac{1}{4}) \hat{\mathbf{x}} - \frac{1}{8}a \hat{\mathbf{y}} + a (y_7 + \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{60} &= \begin{pmatrix} -(y_7 - \frac{1}{8}) \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + \\ (y_7 + \frac{3}{8}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_7 + \frac{1}{4}) \hat{\mathbf{x}} + \frac{1}{8}a \hat{\mathbf{y}} - ay_7 \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{61} &= \begin{pmatrix} -(y_7 - \frac{3}{8}) \mathbf{a}_1 + (y_7 + \frac{1}{8}) \mathbf{a}_2 + \\ \frac{1}{4} \mathbf{a}_3 \end{pmatrix} = ay_7 \hat{\mathbf{x}} - a \begin{pmatrix} (y_7 - \frac{1}{4}) \hat{\mathbf{y}} + \frac{1}{8}a \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{62} &= \begin{pmatrix} -(y_7 - \frac{1}{8}) \mathbf{a}_1 - (y_7 - \frac{3}{8}) \mathbf{a}_2 - \\ (2y_7 - \frac{3}{4}) \mathbf{a}_3 \end{pmatrix} = -a \begin{pmatrix} (y_7 - \frac{1}{2}) \hat{\mathbf{x}} - a (y_7 - \frac{1}{4}) \hat{\mathbf{y}} - \frac{1}{8}a \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{63} &= \begin{pmatrix} (y_7 + \frac{1}{8}) \mathbf{a}_1 + (y_7 + \frac{3}{8}) \mathbf{a}_2 + \\ (2y_7 + \frac{3}{4}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_7 + \frac{1}{2}) \hat{\mathbf{x}} + a (y_7 + \frac{1}{4}) \hat{\mathbf{y}} - \frac{1}{8}a \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{64} &= (y_7 + \frac{3}{8}) \mathbf{a}_1 - (y_7 - \frac{1}{8}) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = -ay_7 \hat{\mathbf{x}} + a \begin{pmatrix} (y_7 + \frac{1}{4}) \hat{\mathbf{y}} + \frac{1}{8}a \hat{\mathbf{z}} \end{pmatrix} & (24h) & \text{Rh IV} \\
\mathbf{B}_{65} &= \begin{pmatrix} (y_8 + z_8) \mathbf{a}_1 + (x_8 + z_8) \mathbf{a}_2 + \\ (x_8 + y_8) \mathbf{a}_3 \end{pmatrix} = ax_8 \hat{\mathbf{x}} + ay_8 \hat{\mathbf{y}} + az_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{66} &= \begin{pmatrix} (-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 \end{pmatrix} = -ax_8 \hat{\mathbf{x}} - a \begin{pmatrix} (y_8 - \frac{1}{2}) \hat{\mathbf{y}} + az_8 \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn II} \\
\mathbf{B}_{67} &= \begin{pmatrix} (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 \end{pmatrix} = -a \begin{pmatrix} (x_8 - \frac{1}{2}) \hat{\mathbf{x}} + ay_8 \hat{\mathbf{y}} - az_8 \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn II} \\
\mathbf{B}_{68} &= \begin{pmatrix} -(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 \end{pmatrix} = ax_8 \hat{\mathbf{x}} - ay_8 \hat{\mathbf{y}} - a \begin{pmatrix} (z_8 - \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn II} \\
\mathbf{B}_{69} &= \begin{pmatrix} (x_8 + y_8) \mathbf{a}_1 + (y_8 + z_8) \mathbf{a}_2 + \\ (x_8 + z_8) \mathbf{a}_3 \end{pmatrix} = az_8 \hat{\mathbf{x}} + ax_8 \hat{\mathbf{y}} + ay_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{70} &= \begin{pmatrix} -(x_8 + y_8 - \frac{1}{2}) \mathbf{a}_1 + \\ (-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_2 - (x_8 - z_8) \mathbf{a}_3 \end{pmatrix} = az_8 \hat{\mathbf{x}} - ax_8 \hat{\mathbf{y}} - a \begin{pmatrix} (y_8 - \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn II} \\
\mathbf{B}_{71} &= \begin{pmatrix} (-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_1 + \\ (y_8 - z_8) \mathbf{a}_2 - (x_8 + z_8 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -az_8 \hat{\mathbf{x}} - a \begin{pmatrix} (x_8 - \frac{1}{2}) \hat{\mathbf{y}} + ay_8 \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn II}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{72} &= (x_8 - y_8) \mathbf{a}_1 - (y_8 + z_8 - \frac{1}{2}) \mathbf{a}_2 + (x_8 - z_8 + \frac{1}{2}) \mathbf{a}_3 = -a(z_8 - \frac{1}{2}) \hat{\mathbf{x}} + ax_8 \hat{\mathbf{y}} - ay_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{73} &= (x_8 + z_8) \mathbf{a}_1 + (x_8 + y_8) \mathbf{a}_2 + (y_8 + z_8) \mathbf{a}_3 = ay_8 \hat{\mathbf{x}} + az_8 \hat{\mathbf{y}} + ax_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{74} &= -(x_8 - z_8) \mathbf{a}_1 - (x_8 + y_8 - \frac{1}{2}) \mathbf{a}_2 + (-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_3 = -a(y_8 - \frac{1}{2}) \hat{\mathbf{x}} + az_8 \hat{\mathbf{y}} - ax_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{75} &= -(x_8 + z_8 - \frac{1}{2}) \mathbf{a}_1 + (-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_2 + (y_8 - z_8) \mathbf{a}_3 = ay_8 \hat{\mathbf{x}} - az_8 \hat{\mathbf{y}} - a(x_8 - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{76} &= (x_8 - z_8 + \frac{1}{2}) \mathbf{a}_1 + (x_8 - y_8) \mathbf{a}_2 - (y_8 + z_8 - \frac{1}{2}) \mathbf{a}_3 = -ay_8 \hat{\mathbf{x}} - a(z_8 - \frac{1}{2}) \hat{\mathbf{y}} + ax_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{77} &= (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}} - a(z_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{78} &= -(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}} - a(z_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{79} &= -(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}} + a(z_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{80} &= (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}} + a(z_8 + \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{81} &= (-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_1 + (x_8 - y_8) \mathbf{a}_2 + (x_8 + z_8) \mathbf{a}_3 = a(x_8 - \frac{1}{4}) \hat{\mathbf{x}} + a(z_8 + \frac{1}{4}) \hat{\mathbf{y}} - a(y_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{82} &= (y_8 + z_8) \mathbf{a}_1 + (-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_2 - (x_8 - z_8) \mathbf{a}_3 = -a(x_8 - \frac{1}{4}) \hat{\mathbf{x}} + a(z_8 - \frac{1}{4}) \hat{\mathbf{y}} + a(y_8 + \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{83} &= -(y_8 + z_8 - \frac{1}{2}) \mathbf{a}_1 - (x_8 + y_8 - \frac{1}{2}) \mathbf{a}_2 - (x_8 + z_8 - \frac{1}{2}) \mathbf{a}_3 = -a(x_8 - \frac{1}{4}) \hat{\mathbf{x}} - a(z_8 - \frac{1}{4}) \hat{\mathbf{y}} - a(y_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{84} &= (y_8 - z_8) \mathbf{a}_1 + (x_8 + y_8) \mathbf{a}_2 + (x_8 - z_8 + \frac{1}{2}) \mathbf{a}_3 = a(x_8 + \frac{1}{4}) \hat{\mathbf{x}} - a(z_8 - \frac{1}{4}) \hat{\mathbf{y}} + a(y_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{85} &= (-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_1 - (x_8 - z_8) \mathbf{a}_2 + (y_8 + z_8) \mathbf{a}_3 = a(z_8 - \frac{1}{4}) \hat{\mathbf{x}} + a(y_8 + \frac{1}{4}) \hat{\mathbf{y}} - a(x_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{86} &= (x_8 - y_8) \mathbf{a}_1 + (x_8 + z_8) \mathbf{a}_2 + (-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_3 = a(z_8 + \frac{1}{4}) \hat{\mathbf{x}} - a(y_8 - \frac{1}{4}) \hat{\mathbf{y}} + a(x_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{87} &= (x_8 + y_8) \mathbf{a}_1 + (x_8 - z_8 + \frac{1}{2}) \mathbf{a}_2 + (y_8 - z_8) \mathbf{a}_3 = -a(z_8 - \frac{1}{4}) \hat{\mathbf{x}} + a(y_8 - \frac{1}{4}) \hat{\mathbf{y}} + a(x_8 + \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{88} &= -(x_8 + y_8 - \frac{1}{2}) \mathbf{a}_1 - (x_8 + z_8 - \frac{1}{2}) \mathbf{a}_2 - (y_8 + z_8 - \frac{1}{2}) \mathbf{a}_3 = -a(z_8 - \frac{1}{4}) \hat{\mathbf{x}} - a(y_8 - \frac{1}{4}) \hat{\mathbf{y}} - a(x_8 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{89} &= (y_9 + z_9) \mathbf{a}_1 + (x_9 + z_9) \mathbf{a}_2 + (x_9 + y_9) \mathbf{a}_3 = ax_9 \hat{\mathbf{x}} + ay_9 \hat{\mathbf{y}} + az_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{90} &= (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_1 - (x_9 - z_9) \mathbf{a}_2 - (x_9 + y_9 - \frac{1}{2}) \mathbf{a}_3 = -ax_9 \hat{\mathbf{x}} - a(y_9 - \frac{1}{2}) \hat{\mathbf{y}} + az_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{91} &= (y_9 - z_9) \mathbf{a}_1 - (x_9 + z_9 - \frac{1}{2}) \mathbf{a}_2 + (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_3 = -a(x_9 - \frac{1}{2}) \hat{\mathbf{x}} + ay_9 \hat{\mathbf{y}} - az_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{92} &= -(y_9 + z_9 - \frac{1}{2}) \mathbf{a}_1 + (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_2 + (x_9 - y_9) \mathbf{a}_3 = ax_9 \hat{\mathbf{x}} - ay_9 \hat{\mathbf{y}} - a(z_9 - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{93} &= (x_9 + y_9) \mathbf{a}_1 + (y_9 + z_9) \mathbf{a}_2 + (x_9 + z_9) \mathbf{a}_3 = az_9 \hat{\mathbf{x}} + ax_9 \hat{\mathbf{y}} + ay_9 \hat{\mathbf{z}} & (48i) & \text{Sn III}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{94} &= \begin{pmatrix} -(x_9 + y_9 - \frac{1}{2}) \mathbf{a}_1 + \\ (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_2 - (x_9 - z_9) \mathbf{a}_3 \end{pmatrix} = az_9 \hat{\mathbf{x}} - ax_9 \hat{\mathbf{y}} - a(y_9 - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{95} &= \begin{pmatrix} (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_1 + \\ (y_9 - z_9) \mathbf{a}_2 - (x_9 + z_9 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -az_9 \hat{\mathbf{x}} - a(x_9 - \frac{1}{2}) \hat{\mathbf{y}} + ay_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{96} &= \begin{pmatrix} (x_9 - y_9) \mathbf{a}_1 - (y_9 + z_9 - \frac{1}{2}) \mathbf{a}_2 + \\ (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(z_9 - \frac{1}{2}) \hat{\mathbf{x}} + ax_9 \hat{\mathbf{y}} - ay_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{97} &= \begin{pmatrix} (x_9 + z_9) \mathbf{a}_1 + (x_9 + y_9) \mathbf{a}_2 + \\ (y_9 + z_9) \mathbf{a}_3 \end{pmatrix} = ay_9 \hat{\mathbf{x}} + az_9 \hat{\mathbf{y}} + ax_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{98} &= \begin{pmatrix} -(x_9 - z_9) \mathbf{a}_1 - \\ (x_9 + y_9 - \frac{1}{2}) \mathbf{a}_2 + \\ (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(y_9 - \frac{1}{2}) \hat{\mathbf{x}} + az_9 \hat{\mathbf{y}} - ax_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{99} &= \begin{pmatrix} -(x_9 + z_9 - \frac{1}{2}) \mathbf{a}_1 + \\ (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_2 + (y_9 - z_9) \mathbf{a}_3 \end{pmatrix} = ay_9 \hat{\mathbf{x}} - az_9 \hat{\mathbf{y}} - a(x_9 - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{100} &= \begin{pmatrix} (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_1 + \\ (x_9 - y_9) \mathbf{a}_2 - (y_9 + z_9 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -ay_9 \hat{\mathbf{x}} - a(z_9 - \frac{1}{2}) \hat{\mathbf{y}} + ax_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{101} &= \begin{pmatrix} (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_1 + \\ (y_9 - z_9) \mathbf{a}_2 + (x_9 + y_9) \mathbf{a}_3 \end{pmatrix} = a(y_9 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_9 + \frac{1}{4}) \hat{\mathbf{y}} - a(z_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{102} &= \begin{pmatrix} -(x_9 + z_9 - \frac{1}{2}) \mathbf{a}_1 - \\ (y_9 + z_9 - \frac{1}{2}) \mathbf{a}_2 - \\ (x_9 + y_9 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(y_9 - \frac{1}{4}) \hat{\mathbf{x}} - a(x_9 - \frac{1}{4}) \hat{\mathbf{y}} - a(z_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{103} &= \begin{pmatrix} -(x_9 - z_9) \mathbf{a}_1 + (y_9 + z_9) \mathbf{a}_2 + \\ (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a(y_9 + \frac{1}{4}) \hat{\mathbf{x}} - a(x_9 - \frac{1}{4}) \hat{\mathbf{y}} + a(z_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{104} &= \begin{pmatrix} (x_9 + z_9) \mathbf{a}_1 + \\ (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_2 + (x_9 - y_9) \mathbf{a}_3 \end{pmatrix} = -a(y_9 - \frac{1}{4}) \hat{\mathbf{x}} + a(x_9 - \frac{1}{4}) \hat{\mathbf{y}} + a(z_9 + \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{105} &= \begin{pmatrix} (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_1 + \\ (x_9 - y_9) \mathbf{a}_2 + (x_9 + z_9) \mathbf{a}_3 \end{pmatrix} = a(x_9 - \frac{1}{4}) \hat{\mathbf{x}} + a(z_9 + \frac{1}{4}) \hat{\mathbf{y}} - a(y_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{106} &= \begin{pmatrix} (y_9 + z_9) \mathbf{a}_1 + \\ (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_2 - (x_9 - z_9) \mathbf{a}_3 \end{pmatrix} = -a(x_9 - \frac{1}{4}) \hat{\mathbf{x}} + a(z_9 - \frac{1}{4}) \hat{\mathbf{y}} + a(y_9 + \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{107} &= \begin{pmatrix} -(y_9 + z_9 - \frac{1}{2}) \mathbf{a}_1 - \\ (x_9 + y_9 - \frac{1}{2}) \mathbf{a}_2 - \\ (x_9 + z_9 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(x_9 - \frac{1}{4}) \hat{\mathbf{x}} - a(z_9 - \frac{1}{4}) \hat{\mathbf{y}} - a(y_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{108} &= \begin{pmatrix} (y_9 - z_9) \mathbf{a}_1 + (x_9 + y_9) \mathbf{a}_2 + \\ (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a(x_9 + \frac{1}{4}) \hat{\mathbf{x}} - a(z_9 - \frac{1}{4}) \hat{\mathbf{y}} + a(y_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{109} &= \begin{pmatrix} (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_1 - \\ (x_9 - z_9) \mathbf{a}_2 + (y_9 + z_9) \mathbf{a}_3 \end{pmatrix} = a(z_9 - \frac{1}{4}) \hat{\mathbf{x}} + a(y_9 + \frac{1}{4}) \hat{\mathbf{y}} - a(x_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{110} &= \begin{pmatrix} (x_9 - y_9) \mathbf{a}_1 + (x_9 + z_9) \mathbf{a}_2 + \\ (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a(z_9 + \frac{1}{4}) \hat{\mathbf{x}} - a(y_9 - \frac{1}{4}) \hat{\mathbf{y}} + a(x_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{111} &= \begin{pmatrix} (x_9 + y_9) \mathbf{a}_1 + \\ (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_2 + (y_9 - z_9) \mathbf{a}_3 \end{pmatrix} = -a(z_9 - \frac{1}{4}) \hat{\mathbf{x}} + a(y_9 - \frac{1}{4}) \hat{\mathbf{y}} + a(x_9 + \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{112} &= \begin{pmatrix} -(x_9 + y_9 - \frac{1}{2}) \mathbf{a}_1 - \\ (x_9 + z_9 - \frac{1}{2}) \mathbf{a}_2 - \\ (y_9 + z_9 - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(z_9 - \frac{1}{4}) \hat{\mathbf{x}} - a(y_9 - \frac{1}{4}) \hat{\mathbf{y}} - a(x_9 - \frac{1}{4}) \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{113} &= \begin{pmatrix} (y_{10} + z_{10}) \mathbf{a}_1 + (x_{10} + z_{10}) \mathbf{a}_2 + \\ (x_{10} + y_{10}) \mathbf{a}_3 \end{pmatrix} = ax_{10} \hat{\mathbf{x}} + ay_{10} \hat{\mathbf{y}} + az_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{114} &= \begin{pmatrix} (-y_{10} + z_{10} + \frac{1}{2}) \mathbf{a}_1 - \\ (x_{10} - z_{10}) \mathbf{a}_2 - \\ (x_{10} + y_{10} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -ax_{10} \hat{\mathbf{x}} - a(y_{10} - \frac{1}{2}) \hat{\mathbf{y}} + az_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{115} &= \begin{pmatrix} (y_{10} - z_{10}) \mathbf{a}_1 - \\ (x_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_2 + \\ (-x_{10} + y_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a \left(x_{10} - \frac{1}{2} \right) \hat{\mathbf{x}} + ay_{10} \hat{\mathbf{y}} - az_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{116} &= \begin{pmatrix} -(y_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_1 + \\ (x_{10} - z_{10} + \frac{1}{2}) \mathbf{a}_2 + \\ (x_{10} - y_{10}) \mathbf{a}_3 \end{pmatrix} = ax_{10} \hat{\mathbf{x}} - ay_{10} \hat{\mathbf{y}} - a \left(z_{10} - \frac{1}{2} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{117} &= \begin{pmatrix} (x_{10} + y_{10}) \mathbf{a}_1 + (y_{10} + z_{10}) \mathbf{a}_2 + \\ (x_{10} + z_{10}) \mathbf{a}_3 \end{pmatrix} = az_{10} \hat{\mathbf{x}} + ax_{10} \hat{\mathbf{y}} + ay_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{118} &= \begin{pmatrix} -(x_{10} + y_{10} - \frac{1}{2}) \mathbf{a}_1 + \\ (-y_{10} + z_{10} + \frac{1}{2}) \mathbf{a}_2 - \\ (x_{10} - z_{10}) \mathbf{a}_3 \end{pmatrix} = az_{10} \hat{\mathbf{x}} - ax_{10} \hat{\mathbf{y}} - a \left(y_{10} - \frac{1}{2} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{119} &= \begin{pmatrix} (-x_{10} + y_{10} + \frac{1}{2}) \mathbf{a}_1 + \\ (y_{10} - z_{10}) \mathbf{a}_2 - \\ (x_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -az_{10} \hat{\mathbf{x}} - a \left(x_{10} - \frac{1}{2} \right) \hat{\mathbf{y}} + ay_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{120} &= \begin{pmatrix} (x_{10} - y_{10}) \mathbf{a}_1 - \\ (y_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_2 + \\ (x_{10} - z_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a \left(z_{10} - \frac{1}{2} \right) \hat{\mathbf{x}} + ax_{10} \hat{\mathbf{y}} - ay_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{121} &= \begin{pmatrix} (x_{10} + z_{10}) \mathbf{a}_1 + \\ (x_{10} + y_{10}) \mathbf{a}_2 + (y_{10} + z_{10}) \mathbf{a}_3 \end{pmatrix} = ay_{10} \hat{\mathbf{x}} + az_{10} \hat{\mathbf{y}} + ax_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{122} &= \begin{pmatrix} -(x_{10} - z_{10}) \mathbf{a}_1 - \\ (x_{10} + y_{10} - \frac{1}{2}) \mathbf{a}_2 + \\ (-y_{10} + z_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a \left(y_{10} - \frac{1}{2} \right) \hat{\mathbf{x}} + az_{10} \hat{\mathbf{y}} - ax_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{123} &= \begin{pmatrix} -(x_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_1 + \\ (-x_{10} + y_{10} + \frac{1}{2}) \mathbf{a}_2 + \\ (y_{10} - z_{10}) \mathbf{a}_3 \end{pmatrix} = ay_{10} \hat{\mathbf{x}} - az_{10} \hat{\mathbf{y}} - a \left(x_{10} - \frac{1}{2} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{124} &= \begin{pmatrix} (x_{10} - z_{10} + \frac{1}{2}) \mathbf{a}_1 + \\ (x_{10} - y_{10}) \mathbf{a}_2 - \\ (y_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -ay_{10} \hat{\mathbf{x}} - a \left(z_{10} - \frac{1}{2} \right) \hat{\mathbf{y}} + ax_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{125} &= \begin{pmatrix} (x_{10} - z_{10} + \frac{1}{2}) \mathbf{a}_1 + \\ (y_{10} - z_{10}) \mathbf{a}_2 + (x_{10} + y_{10}) \mathbf{a}_3 \end{pmatrix} = a \left(y_{10} - \frac{1}{4} \right) \hat{\mathbf{x}} + a \left(x_{10} + \frac{1}{4} \right) \hat{\mathbf{y}} - a \left(z_{10} - \frac{1}{4} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{126} &= \begin{pmatrix} -(x_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_1 - \\ (y_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_2 - \\ (x_{10} + y_{10} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a \left(y_{10} - \frac{1}{4} \right) \hat{\mathbf{x}} - a \left(x_{10} - \frac{1}{4} \right) \hat{\mathbf{y}} - a \left(z_{10} - \frac{1}{4} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{127} &= \begin{pmatrix} -(x_{10} - z_{10}) \mathbf{a}_1 + \\ (y_{10} + z_{10}) \mathbf{a}_2 + \\ (-x_{10} + y_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a \left(y_{10} + \frac{1}{4} \right) \hat{\mathbf{x}} - a \left(x_{10} - \frac{1}{4} \right) \hat{\mathbf{y}} + a \left(z_{10} - \frac{1}{4} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{128} &= \begin{pmatrix} (x_{10} + z_{10}) \mathbf{a}_1 + \\ (-y_{10} + z_{10} + \frac{1}{2}) \mathbf{a}_2 + \\ (x_{10} - y_{10}) \mathbf{a}_3 \end{pmatrix} = -a \left(y_{10} - \frac{1}{4} \right) \hat{\mathbf{x}} + a \left(x_{10} - \frac{1}{4} \right) \hat{\mathbf{y}} + a \left(z_{10} + \frac{1}{4} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{129} &= \begin{pmatrix} (-y_{10} + z_{10} + \frac{1}{2}) \mathbf{a}_1 + \\ (x_{10} - y_{10}) \mathbf{a}_2 + (x_{10} + z_{10}) \mathbf{a}_3 \end{pmatrix} = a \left(x_{10} - \frac{1}{4} \right) \hat{\mathbf{x}} + a \left(z_{10} + \frac{1}{4} \right) \hat{\mathbf{y}} - a \left(y_{10} - \frac{1}{4} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{130} &= \begin{pmatrix} (y_{10} + z_{10}) \mathbf{a}_1 + \\ (-x_{10} + y_{10} + \frac{1}{2}) \mathbf{a}_2 - \\ (x_{10} - z_{10}) \mathbf{a}_3 \end{pmatrix} = -a \left(x_{10} - \frac{1}{4} \right) \hat{\mathbf{x}} + a \left(z_{10} - \frac{1}{4} \right) \hat{\mathbf{y}} + a \left(y_{10} + \frac{1}{4} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{131} &= \begin{pmatrix} -(y_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_1 - \\ (x_{10} + y_{10} - \frac{1}{2}) \mathbf{a}_2 - \\ (x_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a \left(x_{10} - \frac{1}{4} \right) \hat{\mathbf{x}} - a \left(z_{10} - \frac{1}{4} \right) \hat{\mathbf{y}} - a \left(y_{10} - \frac{1}{4} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{132} &= \begin{pmatrix} (y_{10} - z_{10}) \mathbf{a}_1 + (x_{10} + y_{10}) \mathbf{a}_2 + \\ (x_{10} - z_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a \left(x_{10} + \frac{1}{4} \right) \hat{\mathbf{x}} - a \left(z_{10} - \frac{1}{4} \right) \hat{\mathbf{y}} + a \left(y_{10} - \frac{1}{4} \right) \hat{\mathbf{z}} & (48i) & \text{Sn IV}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{133} &= \begin{pmatrix} (-x_{10} + y_{10} + \frac{1}{2}) \mathbf{a}_1 - \\ (x_{10} - z_{10}) \mathbf{a}_2 + (y_{10} + z_{10}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (z_{10} - \frac{1}{4}) \hat{\mathbf{x}} + a (y_{10} + \frac{1}{4}) \hat{\mathbf{y}} - \\ a (x_{10} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn IV} \\
\mathbf{B}_{134} &= \begin{pmatrix} (x_{10} - y_{10}) \mathbf{a}_1 + (x_{10} + z_{10}) \mathbf{a}_2 + \\ (-y_{10} + z_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (z_{10} + \frac{1}{4}) \hat{\mathbf{x}} - a (y_{10} - \frac{1}{4}) \hat{\mathbf{y}} + \\ a (x_{10} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn IV} \\
\mathbf{B}_{135} &= \begin{pmatrix} (x_{10} + y_{10}) \mathbf{a}_1 + \\ (x_{10} - z_{10} + \frac{1}{2}) \mathbf{a}_2 + \\ (y_{10} - z_{10}) \mathbf{a}_3 \end{pmatrix} = -a \begin{pmatrix} (z_{10} - \frac{1}{4}) \hat{\mathbf{x}} + a (y_{10} - \frac{1}{4}) \hat{\mathbf{y}} + \\ a (x_{10} + \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn IV} \\
\mathbf{B}_{136} &= \begin{pmatrix} -(x_{10} + y_{10} - \frac{1}{2}) \mathbf{a}_1 - \\ (x_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_2 - \\ (y_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a \begin{pmatrix} (z_{10} - \frac{1}{4}) \hat{\mathbf{x}} - a (y_{10} - \frac{1}{4}) \hat{\mathbf{y}} - \\ a (x_{10} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn IV} \\
\mathbf{B}_{137} &= \begin{pmatrix} (y_{11} + z_{11}) \mathbf{a}_1 + (x_{11} + z_{11}) \mathbf{a}_2 + \\ (x_{11} + y_{11}) \mathbf{a}_3 \end{pmatrix} = ax_{11} \hat{\mathbf{x}} + ay_{11} \hat{\mathbf{y}} + az_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{138} &= \begin{pmatrix} (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_1 - \\ (x_{11} - z_{11}) \mathbf{a}_2 - \\ (x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -ax_{11} \hat{\mathbf{x}} - a (y_{11} - \frac{1}{2}) \hat{\mathbf{y}} + az_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{139} &= \begin{pmatrix} (y_{11} - z_{11}) \mathbf{a}_1 - \\ (x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_2 + \\ (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a (x_{11} - \frac{1}{2}) \hat{\mathbf{x}} + ay_{11} \hat{\mathbf{y}} - az_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{140} &= \begin{pmatrix} -(y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_1 + \\ (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_2 + \\ (x_{11} - y_{11}) \mathbf{a}_3 \end{pmatrix} = ax_{11} \hat{\mathbf{x}} - ay_{11} \hat{\mathbf{y}} - a (z_{11} - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{141} &= \begin{pmatrix} (x_{11} + y_{11}) \mathbf{a}_1 + (y_{11} + z_{11}) \mathbf{a}_2 + \\ (x_{11} + z_{11}) \mathbf{a}_3 \end{pmatrix} = az_{11} \hat{\mathbf{x}} + ax_{11} \hat{\mathbf{y}} + ay_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{142} &= \begin{pmatrix} -(x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_1 + \\ (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_2 - \\ (x_{11} - z_{11}) \mathbf{a}_3 \end{pmatrix} = az_{11} \hat{\mathbf{x}} - ax_{11} \hat{\mathbf{y}} - a (y_{11} - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{143} &= \begin{pmatrix} (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_1 + \\ (y_{11} - z_{11}) \mathbf{a}_2 - \\ (x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -az_{11} \hat{\mathbf{x}} - a (x_{11} - \frac{1}{2}) \hat{\mathbf{y}} + ay_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{144} &= \begin{pmatrix} (x_{11} - y_{11}) \mathbf{a}_1 - \\ (y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_2 + \\ (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a (z_{11} - \frac{1}{2}) \hat{\mathbf{x}} + ax_{11} \hat{\mathbf{y}} - ay_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{145} &= \begin{pmatrix} (x_{11} + z_{11}) \mathbf{a}_1 + \\ (x_{11} + y_{11}) \mathbf{a}_2 + (y_{11} + z_{11}) \mathbf{a}_3 \end{pmatrix} = ay_{11} \hat{\mathbf{x}} + az_{11} \hat{\mathbf{y}} + ax_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{146} &= \begin{pmatrix} -(x_{11} - z_{11}) \mathbf{a}_1 - \\ (x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_2 + \\ (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a (y_{11} - \frac{1}{2}) \hat{\mathbf{x}} + az_{11} \hat{\mathbf{y}} - ax_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{147} &= \begin{pmatrix} -(x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_1 + \\ (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_2 + \\ (y_{11} - z_{11}) \mathbf{a}_3 \end{pmatrix} = ay_{11} \hat{\mathbf{x}} - az_{11} \hat{\mathbf{y}} - a (x_{11} - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{148} &= \begin{pmatrix} (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_1 + \\ (x_{11} - y_{11}) \mathbf{a}_2 - \\ (y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -ay_{11} \hat{\mathbf{x}} - a (z_{11} - \frac{1}{2}) \hat{\mathbf{y}} + ax_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
\mathbf{B}_{149} &= \begin{pmatrix} (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_1 + \\ (y_{11} - z_{11}) \mathbf{a}_2 + (x_{11} + y_{11}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_{11} - \frac{1}{4}) \hat{\mathbf{x}} + a (x_{11} + \frac{1}{4}) \hat{\mathbf{y}} - \\ a (z_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{150} &= \begin{pmatrix} -(x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_1 - \\ (y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_2 - \\ (x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a \begin{pmatrix} (y_{11} - \frac{1}{4}) \hat{\mathbf{x}} - a (x_{11} - \frac{1}{4}) \hat{\mathbf{y}} - \\ a (z_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{151} &= \begin{pmatrix} -(x_{11} - z_{11}) \mathbf{a}_1 + \\ (y_{11} + z_{11}) \mathbf{a}_2 + \\ (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} a(y_{11} + \frac{1}{4}) \hat{\mathbf{x}} - a(x_{11} - \frac{1}{4}) \hat{\mathbf{y}} + \\ a(z_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{152} &= \begin{pmatrix} (x_{11} + z_{11}) \mathbf{a}_1 + \\ (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_2 + \\ (x_{11} - y_{11}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} -a(y_{11} - \frac{1}{4}) \hat{\mathbf{x}} + a(x_{11} - \frac{1}{4}) \hat{\mathbf{y}} + \\ a(z_{11} + \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{153} &= \begin{pmatrix} (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_1 + \\ (x_{11} - y_{11}) \mathbf{a}_2 + (x_{11} + z_{11}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} a(x_{11} - \frac{1}{4}) \hat{\mathbf{x}} + a(z_{11} + \frac{1}{4}) \hat{\mathbf{y}} - \\ a(y_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{154} &= \begin{pmatrix} (y_{11} + z_{11}) \mathbf{a}_1 + \\ (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_2 - \\ (x_{11} - z_{11}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} -a(x_{11} - \frac{1}{4}) \hat{\mathbf{x}} + a(z_{11} - \frac{1}{4}) \hat{\mathbf{y}} + \\ a(y_{11} + \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{155} &= \begin{pmatrix} -(y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_1 - \\ (x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_2 - \\ (x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} -a(x_{11} - \frac{1}{4}) \hat{\mathbf{x}} - a(z_{11} - \frac{1}{4}) \hat{\mathbf{y}} - \\ a(y_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{156} &= \begin{pmatrix} (y_{11} - z_{11}) \mathbf{a}_1 + (x_{11} + y_{11}) \mathbf{a}_2 + \\ (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} a(x_{11} + \frac{1}{4}) \hat{\mathbf{x}} - a(z_{11} - \frac{1}{4}) \hat{\mathbf{y}} + \\ a(y_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{157} &= \begin{pmatrix} (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_1 - \\ (x_{11} - z_{11}) \mathbf{a}_2 + (y_{11} + z_{11}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} a(z_{11} - \frac{1}{4}) \hat{\mathbf{x}} + a(y_{11} + \frac{1}{4}) \hat{\mathbf{y}} - \\ a(x_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{158} &= \begin{pmatrix} (x_{11} - y_{11}) \mathbf{a}_1 + (x_{11} + z_{11}) \mathbf{a}_2 + \\ (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} a(z_{11} + \frac{1}{4}) \hat{\mathbf{x}} - a(y_{11} - \frac{1}{4}) \hat{\mathbf{y}} + \\ a(x_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{159} &= \begin{pmatrix} (x_{11} + y_{11}) \mathbf{a}_1 + \\ (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_2 + \\ (y_{11} - z_{11}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} -a(z_{11} - \frac{1}{4}) \hat{\mathbf{x}} + a(y_{11} - \frac{1}{4}) \hat{\mathbf{y}} + \\ a(x_{11} + \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V} \\
\mathbf{B}_{160} &= \begin{pmatrix} -(x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_1 - \\ (x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_2 - \\ (y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} -a(z_{11} - \frac{1}{4}) \hat{\mathbf{x}} - a(y_{11} - \frac{1}{4}) \hat{\mathbf{y}} - \\ a(x_{11} - \frac{1}{4}) \hat{\mathbf{z}} \end{pmatrix} & (48i) & \text{Sn V}
\end{aligned}$$

References

- [1] P. Bordet, D. E. Cox, G. P. Espinosa, J. L. Hodeau, and M. Marezio, *Synchrotron X-ray powder diffraction study of the phase I' compound: $\text{SnLa}_3\text{Rh}_4\text{Sn}_{12}$* , Solid State Commun. **78**, 359–366 (1991), doi:10.1016/0038-1098(91)90684-N.

Found in

- [1] P. Villars, *$\text{La}_3\text{Rh}_4\text{Sn}_{13}$ ht Crystal Structure* (2016). PAULING FILE in: Inorganic Solid Phases, SpringerMaterials (online database), Springer, Heidelberg (ed.) SpringerMaterials.

First cited in

H. Eckert, S. Divilov, M. J. Mehl, D. Hicks, A. C. Zettel, M. Esters, X. Campilongo, and S. Curtarolo, *The AFLOW Library of Crystallographic Prototypes: Part 4*, Comput. Mater. Sci. **240**, 112988 (2024), doi: 10.1016/j.commatsci.2024.112988.