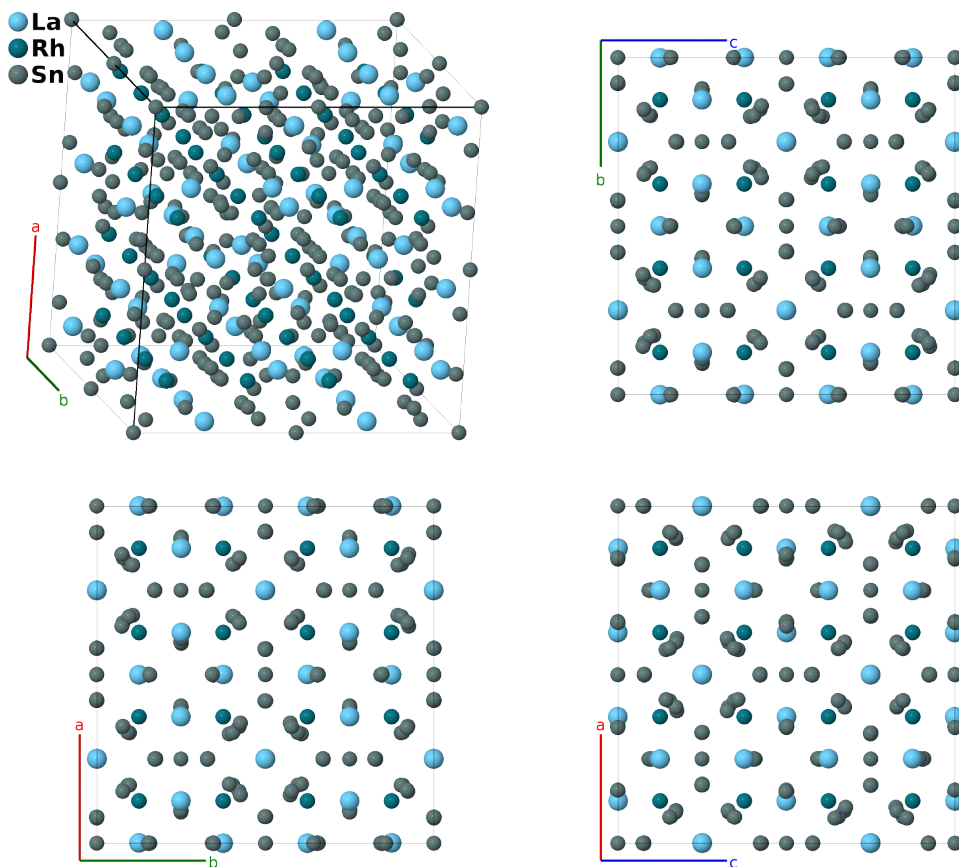


La₃Rh₄Sn₁₃ Structure: A3B4C13_cI320_214_gh_abgh_e4i-001

Cite this page as: H. Eckert, S. Divilov, A. Zettel, M. J. Mehl, D. Hicks, and S. Curtarolo, *The AFLOW Library of Crystallographic Prototypes: Part 4*. In preparation.

<https://aflow.org/p/1DPD>

https://aflow.org/p/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
Pearson symbol	cI320
Space group number	214
Space group symbol	<i>I</i> 4 ₁ 32
AFLOW prototype command	<code>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</code>

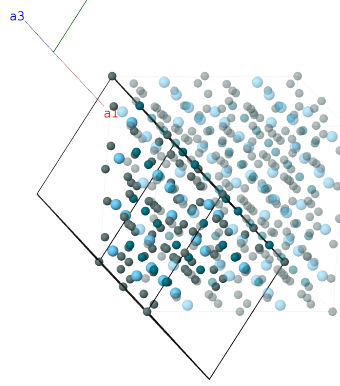
Other compounds with this structure

Ca₃Rh₄Sn₁₃, Ce₃Rh₄Sn₁₃, Gd₃Rh₄Sn₁₃, Nd₃Rh₄Sn₁₃, Pr₃Rh₄Sn₁₃, Sm₃Rh₄Sn₁₃, Tb₃Rh₄Sn₁₃, Th₃Rh₄Sn₁₃, Yb₃Rh₄Sn₁₃

- (Bordet, 1991) refers to this as the “phase I” structure of materials with the formula $M_3Rh_4Sn_{13}$, with the “phase I” structure represented by the centrosymmetric $Yb_3Rh_4Sn_{13}$ phase.
- (Villars, 2016) calls this the high-temperature phase of $La_3Rh_4Sn_{13}$.

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}	$= -(2y_4 - \frac{1}{4}) \mathbf{a}_1 - (y_4 - \frac{3}{8}) \mathbf{a}_2 - (y_4 - \frac{1}{8}) \mathbf{a}_3$	$=$	$\frac{1}{8}a \hat{\mathbf{x}} - ay_4 \hat{\mathbf{y}} - a(y_4 - \frac{1}{4}) \hat{\mathbf{z}}$	(24g)	La I
\mathbf{B}_{21}	$= (y_4 + \frac{1}{8}) \mathbf{a}_1 + (2y_4 + \frac{1}{4}) \mathbf{a}_2 + (y_4 + \frac{3}{8}) \mathbf{a}_3$	$=$	$a(y_4 + \frac{1}{4}) \hat{\mathbf{x}} + \frac{1}{8}a \hat{\mathbf{y}} + ay_4 \hat{\mathbf{z}}$	(24g)	La I

$$\begin{aligned}
\mathbf{B}_{49} &= -\left(y_6 - \frac{3}{8}\right) \mathbf{a}_1 + \left(y_6 + \frac{1}{8}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = ay_6 \hat{\mathbf{x}} - a\left(y_6 - \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{8} a \hat{\mathbf{z}} & (24h) & \text{La II} \\
\mathbf{B}_{50} &= -\left(y_6 - \frac{1}{8}\right) \mathbf{a}_1 - \left(y_6 - \frac{3}{8}\right) \mathbf{a}_2 - \left(2y_6 - \frac{3}{4}\right) \mathbf{a}_3 = -a\left(y_6 - \frac{1}{2}\right) \hat{\mathbf{x}} - a\left(y_6 - \frac{1}{4}\right) \hat{\mathbf{y}} - \frac{1}{8} a \hat{\mathbf{z}} & (24h) & \text{La II} \\
\mathbf{B}_{51} &= \left(y_6 + \frac{1}{8}\right) \mathbf{a}_1 + \left(y_6 + \frac{3}{8}\right) \mathbf{a}_2 + \left(2y_6 + \frac{3}{4}\right) \mathbf{a}_3 = a\left(y_6 + \frac{1}{2}\right) \hat{\mathbf{x}} + a\left(y_6 + \frac{1}{4}\right) \hat{\mathbf{y}} - \frac{1}{8} a \hat{\mathbf{z}} & (24h) & \text{La II} \\
\mathbf{B}_{52} &= \left(y_6 + \frac{3}{8}\right) \mathbf{a}_1 - \left(y_6 - \frac{1}{8}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = -ay_6 \hat{\mathbf{x}} + a\left(y_6 + \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{8} a \hat{\mathbf{z}} & (24h) & \text{La II} \\
\mathbf{B}_{53} &= \frac{1}{4} \mathbf{a}_1 - \left(y_7 - \frac{3}{8}\right) \mathbf{a}_2 + \left(y_7 + \frac{1}{8}\right) \mathbf{a}_3 = \frac{1}{8} a \hat{\mathbf{x}} + ay_7 \hat{\mathbf{y}} - a\left(y_7 - \frac{1}{4}\right) \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{54} &= -\left(2y_7 - \frac{3}{4}\right) \mathbf{a}_1 - \left(y_7 - \frac{1}{8}\right) \mathbf{a}_2 - \left(y_7 - \frac{3}{8}\right) \mathbf{a}_3 = -\frac{1}{8} a \hat{\mathbf{x}} - a\left(y_7 - \frac{1}{2}\right) \hat{\mathbf{y}} - a\left(y_7 - \frac{1}{4}\right) \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{55} &= \left(2y_7 + \frac{3}{4}\right) \mathbf{a}_1 + \left(y_7 + \frac{1}{8}\right) \mathbf{a}_2 + \left(y_7 + \frac{3}{8}\right) \mathbf{a}_3 = -\frac{1}{8} a \hat{\mathbf{x}} + a\left(y_7 + \frac{1}{2}\right) \hat{\mathbf{y}} + a\left(y_7 + \frac{1}{4}\right) \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{56} &= \frac{1}{4} \mathbf{a}_1 + \left(y_7 + \frac{3}{8}\right) \mathbf{a}_2 - \left(y_7 - \frac{1}{8}\right) \mathbf{a}_3 = \frac{1}{8} a \hat{\mathbf{x}} - ay_7 \hat{\mathbf{y}} + a\left(y_7 + \frac{1}{4}\right) \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{57} &= \left(y_7 + \frac{1}{8}\right) \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 - \left(y_7 - \frac{3}{8}\right) \mathbf{a}_3 = -a\left(y_7 - \frac{1}{4}\right) \hat{\mathbf{x}} + \frac{1}{8} a \hat{\mathbf{y}} + ay_7 \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{58} &= -\left(y_7 - \frac{3}{8}\right) \mathbf{a}_1 - \left(2y_7 - \frac{3}{4}\right) \mathbf{a}_2 - \left(y_7 - \frac{1}{8}\right) \mathbf{a}_3 = -a\left(y_7 - \frac{1}{4}\right) \hat{\mathbf{x}} - \frac{1}{8} a \hat{\mathbf{y}} - a\left(y_7 - \frac{1}{2}\right) \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{59} &= \left(y_7 + \frac{3}{8}\right) \mathbf{a}_1 + \left(2y_7 + \frac{3}{4}\right) \mathbf{a}_2 + \left(y_7 + \frac{1}{8}\right) \mathbf{a}_3 = a\left(y_7 + \frac{1}{4}\right) \hat{\mathbf{x}} - \frac{1}{8} a \hat{\mathbf{y}} + a\left(y_7 + \frac{1}{2}\right) \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{60} &= -\left(y_7 - \frac{1}{8}\right) \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + \left(y_7 + \frac{3}{8}\right) \mathbf{a}_3 = a\left(y_7 + \frac{1}{4}\right) \hat{\mathbf{x}} + \frac{1}{8} a \hat{\mathbf{y}} - ay_7 \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{61} &= -\left(y_7 - \frac{3}{8}\right) \mathbf{a}_1 + \left(y_7 + \frac{1}{8}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = ay_7 \hat{\mathbf{x}} - a\left(y_7 - \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{8} a \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{62} &= -\left(y_7 - \frac{1}{8}\right) \mathbf{a}_1 - \left(y_7 - \frac{3}{8}\right) \mathbf{a}_2 - \left(2y_7 - \frac{3}{4}\right) \mathbf{a}_3 = -a\left(y_7 - \frac{1}{2}\right) \hat{\mathbf{x}} - a\left(y_7 - \frac{1}{4}\right) \hat{\mathbf{y}} - \frac{1}{8} a \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{63} &= \left(y_7 + \frac{1}{8}\right) \mathbf{a}_1 + \left(y_7 + \frac{3}{8}\right) \mathbf{a}_2 + \left(2y_7 + \frac{3}{4}\right) \mathbf{a}_3 = a\left(y_7 + \frac{1}{2}\right) \hat{\mathbf{x}} + a\left(y_7 + \frac{1}{4}\right) \hat{\mathbf{y}} - \frac{1}{8} a \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{64} &= \left(y_7 + \frac{3}{8}\right) \mathbf{a}_1 - \left(y_7 - \frac{1}{8}\right) \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3 = -ay_7 \hat{\mathbf{x}} + a\left(y_7 + \frac{1}{4}\right) \hat{\mathbf{y}} + \frac{1}{8} a \hat{\mathbf{z}} & (24h) & \text{Rh IV} \\
\mathbf{B}_{65} &= \left(y_8 + z_8\right) \mathbf{a}_1 + \left(x_8 + z_8\right) \mathbf{a}_2 + \left(x_8 + y_8\right) \mathbf{a}_3 = ax_8 \hat{\mathbf{x}} + ay_8 \hat{\mathbf{y}} + az_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{66} &= \left(-y_8 + z_8 + \frac{1}{2}\right) \mathbf{a}_1 - \left(x_8 - z_8\right) \mathbf{a}_2 - \left(x_8 + y_8 - \frac{1}{2}\right) \mathbf{a}_3 = -ax_8 \hat{\mathbf{x}} - a\left(y_8 - \frac{1}{2}\right) \hat{\mathbf{y}} + az_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{67} &= \left(y_8 - z_8\right) \mathbf{a}_1 - \left(x_8 + z_8 - \frac{1}{2}\right) \mathbf{a}_2 + \left(-x_8 + y_8 + \frac{1}{2}\right) \mathbf{a}_3 = -a\left(x_8 - \frac{1}{2}\right) \hat{\mathbf{x}} + ay_8 \hat{\mathbf{y}} - az_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{68} &= \left(-y_8 + z_8 - \frac{1}{2}\right) \mathbf{a}_1 + \left(x_8 - z_8 + \frac{1}{2}\right) \mathbf{a}_2 + \left(x_8 - y_8\right) \mathbf{a}_3 = ax_8 \hat{\mathbf{x}} - ay_8 \hat{\mathbf{y}} - a\left(z_8 - \frac{1}{2}\right) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{69} &= \left(x_8 + y_8\right) \mathbf{a}_1 + \left(y_8 + z_8\right) \mathbf{a}_2 + \left(x_8 + z_8\right) \mathbf{a}_3 = az_8 \hat{\mathbf{x}} + ax_8 \hat{\mathbf{y}} + ay_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{70} &= \left(-x_8 + y_8 - \frac{1}{2}\right) \mathbf{a}_1 + \left(-y_8 + z_8 + \frac{1}{2}\right) \mathbf{a}_2 - \left(x_8 - z_8\right) \mathbf{a}_3 = az_8 \hat{\mathbf{x}} - ax_8 \hat{\mathbf{y}} - a\left(y_8 - \frac{1}{2}\right) \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{71} &= \left(-x_8 + y_8 + \frac{1}{2}\right) \mathbf{a}_1 + \left(y_8 - z_8\right) \mathbf{a}_2 - \left(x_8 + z_8 - \frac{1}{2}\right) \mathbf{a}_3 = -az_8 \hat{\mathbf{x}} - a\left(x_8 - \frac{1}{2}\right) \hat{\mathbf{y}} + ay_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{72} &= \left(x_8 - y_8\right) \mathbf{a}_1 - \left(y_8 + z_8 - \frac{1}{2}\right) \mathbf{a}_2 + \left(x_8 - z_8 + \frac{1}{2}\right) \mathbf{a}_3 = -a\left(z_8 - \frac{1}{2}\right) \hat{\mathbf{x}} + ax_8 \hat{\mathbf{y}} - ay_8 \hat{\mathbf{z}} & (48i) & \text{Sn II} \\
\mathbf{B}_{73} &= \left(x_8 + z_8\right) \mathbf{a}_1 + \left(x_8 + y_8\right) \mathbf{a}_2 + \left(y_8 + z_8\right) \mathbf{a}_3 = ay_8 \hat{\mathbf{x}} + az_8 \hat{\mathbf{y}} + ax_8 \hat{\mathbf{z}} & (48i) & \text{Sn II}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{74} &= \begin{aligned} &-(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 \end{aligned} &= & -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} &= \begin{aligned} &-(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 \end{aligned} &= & 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} &= \begin{aligned} &(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 \end{aligned} &= & -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} &= \begin{aligned} &(x_8 - z_8 + \frac{1}{2}) \mathbf{a}_1 + \\ &(y_8 - z_8) \mathbf{a}_2 + (x_8 + y_8) \mathbf{a}_3 \end{aligned} &= & 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} &= \begin{aligned} &-(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 \end{aligned} &= & -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} &= \begin{aligned} &-(x_8 - z_8) \mathbf{a}_1 + (y_8 + z_8) \mathbf{a}_2 + \\ &(-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= & 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} &= \begin{aligned} &(x_8 + z_8) \mathbf{a}_1 + \\ &(-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_2 + (x_8 - y_8) \mathbf{a}_3 \end{aligned} &= & -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} &= \begin{aligned} &(-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_1 + \\ &(x_8 - y_8) \mathbf{a}_2 + (x_8 + z_8) \mathbf{a}_3 \end{aligned} &= & 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} &= \begin{aligned} &(y_8 + z_8) \mathbf{a}_1 + \\ &(-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_2 - (x_8 - z_8) \mathbf{a}_3 \end{aligned} &= & -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} &= \begin{aligned} &-(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 \end{aligned} &= & -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} &= \begin{aligned} &(y_8 - z_8) \mathbf{a}_1 + (x_8 + y_8) \mathbf{a}_2 + \\ &(x_8 - z_8 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= & 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} &= \begin{aligned} &(-x_8 + y_8 + \frac{1}{2}) \mathbf{a}_1 - \\ &(x_8 - z_8) \mathbf{a}_2 + (y_8 + z_8) \mathbf{a}_3 \end{aligned} &= & 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} &= \begin{aligned} &(x_8 - y_8) \mathbf{a}_1 + (x_8 + z_8) \mathbf{a}_2 + \\ &(-y_8 + z_8 + \frac{1}{2}) \mathbf{a}_3 \end{aligned} &= & 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} &= \begin{aligned} &(x_8 + y_8) \mathbf{a}_1 + \\ &(x_8 - z_8 + \frac{1}{2}) \mathbf{a}_2 + (y_8 - z_8) \mathbf{a}_3 \end{aligned} &= & -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} &= \begin{aligned} &-(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 \end{aligned} &= & -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} &= \begin{aligned} &(y_9 + z_9) \mathbf{a}_1 + (x_9 + z_9) \mathbf{a}_2 + \\ &(x_9 + y_9) \mathbf{a}_3 \end{aligned} &= & ax_9 \hat{\mathbf{x}} + ay_9 \hat{\mathbf{y}} + az_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{90} &= \begin{aligned} &(-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 \end{aligned} &= & -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} &= \begin{aligned} &(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 \end{aligned} &= & -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} &= \begin{aligned} &-(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 \end{aligned} &= & 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} &= \begin{aligned} &(x_9 + y_9) \mathbf{a}_1 + (y_9 + z_9) \mathbf{a}_2 + \\ &(x_9 + z_9) \mathbf{a}_3 \end{aligned} &= & az_9 \hat{\mathbf{x}} + ax_9 \hat{\mathbf{y}} + ay_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{94} &= \begin{aligned} &-(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{aligned} &= & 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{aligned} &(-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{aligned} &= & -az_9 \hat{\mathbf{x}} - a(x_9 - \frac{1}{2}) \hat{\mathbf{y}} + ay_9 \hat{\mathbf{z}} & (48i) & \text{Sn III}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{96} &= (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 = -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} &= (x_9 + z_9) \mathbf{a}_1 + (x_9 + y_9) \mathbf{a}_2 + (y_9 + z_9) \mathbf{a}_3 = ay_9 \hat{\mathbf{x}} + az_9 \hat{\mathbf{y}} + ax_9 \hat{\mathbf{z}} & (48i) & \text{Sn III} \\
\mathbf{B}_{98} &= -(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 = -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} &= -(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 = 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} &= (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 = -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} &= (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_1 + (y_9 - z_9) \mathbf{a}_2 + (x_9 + y_9) \mathbf{a}_3 = 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} &= -(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 = -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} &= -(x_9 - z_9) \mathbf{a}_1 + (y_9 + z_9) \mathbf{a}_2 + (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_3 = 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} &= (x_9 + z_9) \mathbf{a}_1 + (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_2 + (x_9 - y_9) \mathbf{a}_3 = -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} &= (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_1 + (x_9 - y_9) \mathbf{a}_2 + (x_9 + z_9) \mathbf{a}_3 = 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} &= (y_9 + z_9) \mathbf{a}_1 + (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_2 - (x_9 - z_9) \mathbf{a}_3 = -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} &= -(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 = -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} &= (y_9 - z_9) \mathbf{a}_1 + (x_9 + y_9) \mathbf{a}_2 + (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_3 = 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} &= (-x_9 + y_9 + \frac{1}{2}) \mathbf{a}_1 - (x_9 - z_9) \mathbf{a}_2 + (y_9 + z_9) \mathbf{a}_3 = 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} &= (x_9 - y_9) \mathbf{a}_1 + (x_9 + z_9) \mathbf{a}_2 + (-y_9 + z_9 + \frac{1}{2}) \mathbf{a}_3 = 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} &= (x_9 + y_9) \mathbf{a}_1 + (x_9 - z_9 + \frac{1}{2}) \mathbf{a}_2 + (y_9 - z_9) \mathbf{a}_3 = -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} &= -(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 = -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} &= (y_{10} + z_{10}) \mathbf{a}_1 + (x_{10} + z_{10}) \mathbf{a}_2 + (x_{10} + y_{10}) \mathbf{a}_3 = ax_{10} \hat{\mathbf{x}} + ay_{10} \hat{\mathbf{y}} + az_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{114} &= (-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 = -ax_{10} \hat{\mathbf{x}} - a(y_{10} - \frac{1}{2}) \hat{\mathbf{y}} + az_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV} \\
\mathbf{B}_{115} &= (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 = -a(x_{10} - \frac{1}{2}) \hat{\mathbf{x}} + ay_{10} \hat{\mathbf{y}} - az_{10} \hat{\mathbf{z}} & (48i) & \text{Sn IV}
\end{aligned}$$

$$\begin{aligned}
\mathbf{B}_{134} &= (x_{10} - y_{10}) \mathbf{a}_1 + (x_{10} + z_{10}) \mathbf{a}_2 + &= & a(z_{10} + \frac{1}{4}) \hat{\mathbf{x}} - a(y_{10} - \frac{1}{4}) \hat{\mathbf{y}} + & (48i) & \text{Sn IV} \\
& \quad (-y_{10} + z_{10} + \frac{1}{2}) \mathbf{a}_3 & & \quad a(x_{10} - \frac{1}{4}) \hat{\mathbf{z}} \\
\mathbf{B}_{135} &= (x_{10} + y_{10}) \mathbf{a}_1 + &= & -a(z_{10} - \frac{1}{4}) \hat{\mathbf{x}} + a(y_{10} - \frac{1}{4}) \hat{\mathbf{y}} + & (48i) & \text{Sn IV} \\
& \quad (x_{10} - z_{10} + \frac{1}{2}) \mathbf{a}_2 + & & \quad a(x_{10} + \frac{1}{4}) \hat{\mathbf{z}} \\
& \quad (y_{10} - z_{10}) \mathbf{a}_3 \\
\mathbf{B}_{136} &= -(x_{10} + y_{10} - \frac{1}{2}) \mathbf{a}_1 - &= & -a(z_{10} - \frac{1}{4}) \hat{\mathbf{x}} - a(y_{10} - \frac{1}{4}) \hat{\mathbf{y}} - & (48i) & \text{Sn IV} \\
& \quad (x_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_2 - & & \quad a(x_{10} - \frac{1}{4}) \hat{\mathbf{z}} \\
& \quad (y_{10} + z_{10} - \frac{1}{2}) \mathbf{a}_3 \\
\mathbf{B}_{137} &= (y_{11} + z_{11}) \mathbf{a}_1 + (x_{11} + z_{11}) \mathbf{a}_2 + &= & ax_{11} \hat{\mathbf{x}} + ay_{11} \hat{\mathbf{y}} + az_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (x_{11} + y_{11}) \mathbf{a}_3 \\
\mathbf{B}_{138} &= (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_1 - &= & -ax_{11} \hat{\mathbf{x}} - a(y_{11} - \frac{1}{2}) \hat{\mathbf{y}} + az_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (x_{11} - z_{11}) \mathbf{a}_2 - & & \\
& \quad (x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_3 \\
\mathbf{B}_{139} &= (y_{11} - z_{11}) \mathbf{a}_1 - &= & -a(x_{11} - \frac{1}{2}) \hat{\mathbf{x}} + ay_{11} \hat{\mathbf{y}} - az_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_2 + & & \\
& \quad (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_3 \\
\mathbf{B}_{140} &= -(y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_1 + &= & ax_{11} \hat{\mathbf{x}} - ay_{11} \hat{\mathbf{y}} - a(z_{11} - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_2 + & & \\
& \quad (x_{11} - y_{11}) \mathbf{a}_3 \\
\mathbf{B}_{141} &= (x_{11} + y_{11}) \mathbf{a}_1 + (y_{11} + z_{11}) \mathbf{a}_2 + &= & az_{11} \hat{\mathbf{x}} + ax_{11} \hat{\mathbf{y}} + ay_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (x_{11} + z_{11}) \mathbf{a}_3 \\
\mathbf{B}_{142} &= -(x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_1 + &= & az_{11} \hat{\mathbf{x}} - ax_{11} \hat{\mathbf{y}} - a(y_{11} - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_2 - & & \\
& \quad (x_{11} - z_{11}) \mathbf{a}_3 \\
\mathbf{B}_{143} &= (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_1 + &= & -az_{11} \hat{\mathbf{x}} - a(x_{11} - \frac{1}{2}) \hat{\mathbf{y}} + ay_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (y_{11} - z_{11}) \mathbf{a}_2 - & & \\
& \quad (x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_3 \\
\mathbf{B}_{144} &= (x_{11} - y_{11}) \mathbf{a}_1 - &= & -a(z_{11} - \frac{1}{2}) \hat{\mathbf{x}} + ax_{11} \hat{\mathbf{y}} - ay_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_2 + & & \\
& \quad (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_3 \\
\mathbf{B}_{145} &= (x_{11} + z_{11}) \mathbf{a}_1 + &= & ay_{11} \hat{\mathbf{x}} + az_{11} \hat{\mathbf{y}} + ax_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (x_{11} + y_{11}) \mathbf{a}_2 + (y_{11} + z_{11}) \mathbf{a}_3 \\
\mathbf{B}_{146} &= -(x_{11} - z_{11}) \mathbf{a}_1 - &= & -a(y_{11} - \frac{1}{2}) \hat{\mathbf{x}} + az_{11} \hat{\mathbf{y}} - ax_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_2 + & & \\
& \quad (-y_{11} + z_{11} + \frac{1}{2}) \mathbf{a}_3 \\
\mathbf{B}_{147} &= -(x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_1 + &= & ay_{11} \hat{\mathbf{x}} - az_{11} \hat{\mathbf{y}} - a(x_{11} - \frac{1}{2}) \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_2 + & & \\
& \quad (y_{11} - z_{11}) \mathbf{a}_3 \\
\mathbf{B}_{148} &= (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_1 + &= & -ay_{11} \hat{\mathbf{x}} - a(z_{11} - \frac{1}{2}) \hat{\mathbf{y}} + ax_{11} \hat{\mathbf{z}} & (48i) & \text{Sn V} \\
& \quad (x_{11} - y_{11}) \mathbf{a}_2 - & & \\
& \quad (y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_3 \\
\mathbf{B}_{149} &= (x_{11} - z_{11} + \frac{1}{2}) \mathbf{a}_1 + &= & a(y_{11} - \frac{1}{4}) \hat{\mathbf{x}} + a(x_{11} + \frac{1}{4}) \hat{\mathbf{y}} - & (48i) & \text{Sn V} \\
& \quad (y_{11} - z_{11}) \mathbf{a}_2 + (x_{11} + y_{11}) \mathbf{a}_3 & & \quad a(z_{11} - \frac{1}{4}) \hat{\mathbf{z}} \\
\mathbf{B}_{150} &= -(x_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_1 - &= & -a(y_{11} - \frac{1}{4}) \hat{\mathbf{x}} - a(x_{11} - \frac{1}{4}) \hat{\mathbf{y}} - & (48i) & \text{Sn V} \\
& \quad (y_{11} + z_{11} - \frac{1}{2}) \mathbf{a}_2 - & & \quad a(z_{11} - \frac{1}{4}) \hat{\mathbf{z}} \\
& \quad (x_{11} + y_{11} - \frac{1}{2}) \mathbf{a}_3 \\
\mathbf{B}_{151} &= -(x_{11} - z_{11}) \mathbf{a}_1 + &= & a(y_{11} + \frac{1}{4}) \hat{\mathbf{x}} - a(x_{11} - \frac{1}{4}) \hat{\mathbf{y}} + & (48i) & \text{Sn V} \\
& \quad (y_{11} + z_{11}) \mathbf{a}_2 + & & \quad a(z_{11} - \frac{1}{4}) \hat{\mathbf{z}} \\
& \quad (-x_{11} + y_{11} + \frac{1}{2}) \mathbf{a}_3
\end{aligned}$$

$$\begin{aligned}
\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.