

Sr(OH)₂(H₂O)₈ Structure: A18B10C_tP116_130_2c4g_2c2g_a-001

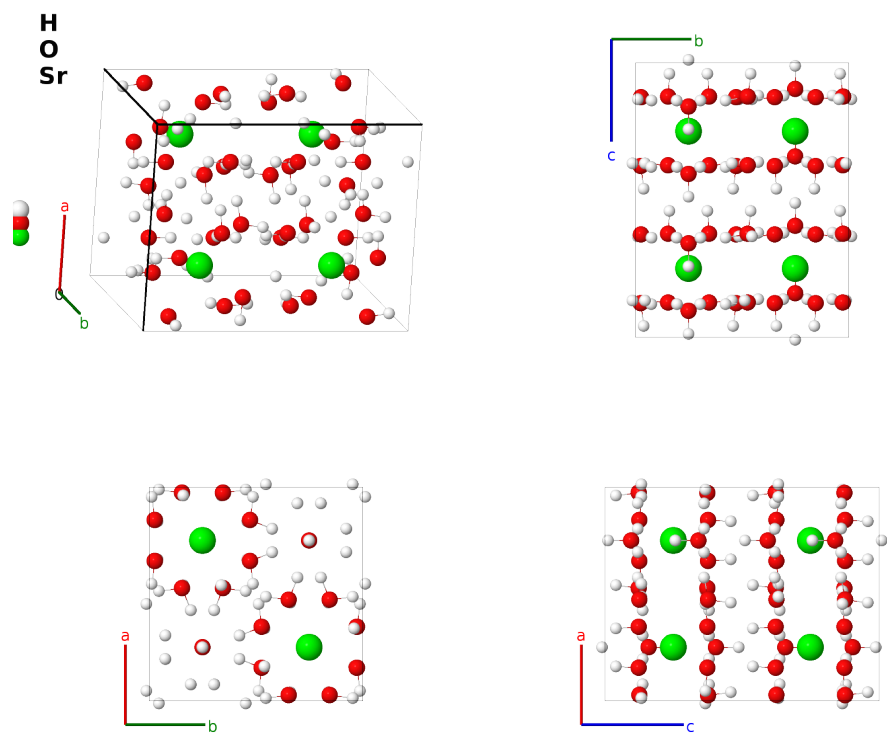
This structure previously used the label(s) **A18B10C_tP116_130_2c4g_2c2g_a**. Calls to these addresses will be redirected here.

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/JDN7>

https://aflow.org/prototype-encyclopedia/A18B10C_tP116_130_2c4g_2c2g_a-001

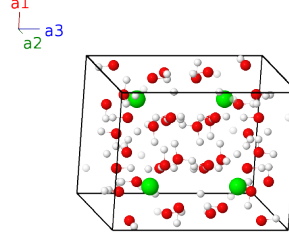


Prototype	H ₁₈ O ₁₀ Sr
AFLOW prototype label	A18B10C_tP116_130_2c4g_2c2g_a-001
ICSD	170827
CCDC	1686219
Pearson symbol	tP116
Space group number	130
Space group symbol	<i>P4/ncc</i>
AFLOW prototype command	<code>aflow --proto=A18B10C_tP116_130_2c4g_2c2g_a-001</code> <code>--params=a, c/a, z₂, z₃, z₄, z₅, x₆, y₆, z₆, x₇, y₇, z₇, x₈, y₈, z₈, x₉, y₉, z₉, x₁₀, y₁₀, z₁₀, x₁₁, y₁₁, z₁₁</code>

- This determination of the crystal structure of $\text{Sr}(\text{OH})_2(\text{H}_2\text{O})_8$ improves upon the the structure found by (Natta, 1928), which was given the *Strukturbericht* designation $E6_1$ by (Hermann, 1937). The new structure quadruples the size of the unit cell, locates the hydrogen atoms, and changes the space group.
- We use the data taken by (Ricci, 2005) at 20K.

Simple Tetragonal primitive vectors

$$\begin{aligned} \mathbf{a}_1 &= a \hat{\mathbf{x}} \\ \mathbf{a}_2 &= a \hat{\mathbf{y}} \\ \mathbf{a}_3 &= c \hat{\mathbf{z}} \end{aligned}$$



Basis vectors

	Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B}_1$	$= \frac{3}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + \frac{1}{4} c \hat{\mathbf{z}}$	(4a)	Sr I
$\mathbf{B}_2$	$= \frac{1}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 + \frac{1}{4} \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} + \frac{1}{4} c \hat{\mathbf{z}}$	(4a)	Sr I
$\mathbf{B}_3$	$= \frac{1}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} + \frac{3}{4} c \hat{\mathbf{z}}$	(4a)	Sr I
$\mathbf{B}_4$	$= \frac{3}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + \frac{3}{4} \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + \frac{3}{4} c \hat{\mathbf{z}}$	(4a)	Sr I
$\mathbf{B}_5$	$= \frac{1}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + z_2 \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c z_2 \hat{\mathbf{z}}$	(4c)	H I
$\mathbf{B}_6$	$= \frac{3}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - (z_2 - \frac{1}{2}) \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} - c (z_2 - \frac{1}{2}) \hat{\mathbf{z}}$	(4c)	H I
$\mathbf{B}_7$	$= \frac{3}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - z_2 \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} - c z_2 \hat{\mathbf{z}}$	(4c)	H I
$\mathbf{B}_8$	$= \frac{1}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + (z_2 + \frac{1}{2}) \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c (z_2 + \frac{1}{2}) \hat{\mathbf{z}}$	(4c)	H I
$\mathbf{B}_9$	$= \frac{1}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + z_3 \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c z_3 \hat{\mathbf{z}}$	(4c)	H II
$\mathbf{B}_{10}$	$= \frac{3}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - (z_3 - \frac{1}{2}) \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} - c (z_3 - \frac{1}{2}) \hat{\mathbf{z}}$	(4c)	H II
$\mathbf{B}_{11}$	$= \frac{3}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - z_3 \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} - c z_3 \hat{\mathbf{z}}$	(4c)	H II
$\mathbf{B}_{12}$	$= \frac{1}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + (z_3 + \frac{1}{2}) \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c (z_3 + \frac{1}{2}) \hat{\mathbf{z}}$	(4c)	H II
$\mathbf{B}_{13}$	$= \frac{1}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + z_4 \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c z_4 \hat{\mathbf{z}}$	(4c)	O I
$\mathbf{B}_{14}$	$= \frac{3}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - (z_4 - \frac{1}{2}) \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} - c (z_4 - \frac{1}{2}) \hat{\mathbf{z}}$	(4c)	O I
$\mathbf{B}_{15}$	$= \frac{3}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - z_4 \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} - c z_4 \hat{\mathbf{z}}$	(4c)	O I
$\mathbf{B}_{16}$	$= \frac{1}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + (z_4 + \frac{1}{2}) \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c (z_4 + \frac{1}{2}) \hat{\mathbf{z}}$	(4c)	O I
$\mathbf{B}_{17}$	$= \frac{1}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + z_5 \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c z_5 \hat{\mathbf{z}}$	(4c)	O II
$\mathbf{B}_{18}$	$= \frac{3}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - (z_5 - \frac{1}{2}) \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} - c (z_5 - \frac{1}{2}) \hat{\mathbf{z}}$	(4c)	O II
$\mathbf{B}_{19}$	$= \frac{3}{4} \mathbf{a}_1 + \frac{3}{4} \mathbf{a}_2 - z_5 \mathbf{a}_3$	$=$	$\frac{3}{4} a \hat{\mathbf{x}} + \frac{3}{4} a \hat{\mathbf{y}} - c z_5 \hat{\mathbf{z}}$	(4c)	O II
$\mathbf{B}_{20}$	$= \frac{1}{4} \mathbf{a}_1 + \frac{1}{4} \mathbf{a}_2 + (z_5 + \frac{1}{2}) \mathbf{a}_3$	$=$	$\frac{1}{4} a \hat{\mathbf{x}} + \frac{1}{4} a \hat{\mathbf{y}} + c (z_5 + \frac{1}{2}) \hat{\mathbf{z}}$	(4c)	O II
$\mathbf{B}_{21}$	$= x_6 \mathbf{a}_1 + y_6 \mathbf{a}_2 + z_6 \mathbf{a}_3$	$=$	$a x_6 \hat{\mathbf{x}} + a y_6 \hat{\mathbf{y}} + c z_6 \hat{\mathbf{z}}$	(16g)	H III
$\mathbf{B}_{22}$	$= - (x_6 - \frac{1}{2}) \mathbf{a}_1 - (y_6 - \frac{1}{2}) \mathbf{a}_2 + z_6 \mathbf{a}_3$	$=$	$-a (x_6 - \frac{1}{2}) \hat{\mathbf{x}} - a (y_6 - \frac{1}{2}) \hat{\mathbf{y}} + c z_6 \hat{\mathbf{z}}$	(16g)	H III

$\mathbf{B}_{23} =$	$-\left(y_6 - \frac{1}{2}\right) \mathbf{a}_1 + x_6 \mathbf{a}_2 + z_6 \mathbf{a}_3$	$=$	$-a\left(y_6 - \frac{1}{2}\right) \hat{\mathbf{x}} + ax_6 \hat{\mathbf{y}} + cz_6 \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{24} =$	$y_6 \mathbf{a}_1 - \left(x_6 - \frac{1}{2}\right) \mathbf{a}_2 + z_6 \mathbf{a}_3$	$=$	$ay_6 \hat{\mathbf{x}} - a\left(x_6 - \frac{1}{2}\right) \hat{\mathbf{y}} + cz_6 \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{25} =$	$-x_6 \mathbf{a}_1 + \left(y_6 + \frac{1}{2}\right) \mathbf{a}_2 -$ $\left(z_6 - \frac{1}{2}\right) \mathbf{a}_3$	$=$	$-ax_6 \hat{\mathbf{x}} + a\left(y_6 + \frac{1}{2}\right) \hat{\mathbf{y}} - c\left(z_6 - \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{26} =$	$\left(x_6 + \frac{1}{2}\right) \mathbf{a}_1 - y_6 \mathbf{a}_2 - \left(z_6 - \frac{1}{2}\right) \mathbf{a}_3$	$=$	$a\left(x_6 + \frac{1}{2}\right) \hat{\mathbf{x}} - ay_6 \hat{\mathbf{y}} - c\left(z_6 - \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{27} =$	$\left(y_6 + \frac{1}{2}\right) \mathbf{a}_1 + \left(x_6 + \frac{1}{2}\right) \mathbf{a}_2 -$ $\left(z_6 - \frac{1}{2}\right) \mathbf{a}_3$	$=$	$a\left(y_6 + \frac{1}{2}\right) \hat{\mathbf{x}} + a\left(x_6 + \frac{1}{2}\right) \hat{\mathbf{y}} - c\left(z_6 - \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{28} =$	$-y_6 \mathbf{a}_1 - x_6 \mathbf{a}_2 - \left(z_6 - \frac{1}{2}\right) \mathbf{a}_3$	$=$	$-ay_6 \hat{\mathbf{x}} - ax_6 \hat{\mathbf{y}} - c\left(z_6 - \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{29} =$	$-x_6 \mathbf{a}_1 - y_6 \mathbf{a}_2 - z_6 \mathbf{a}_3$	$=$	$-ax_6 \hat{\mathbf{x}} - ay_6 \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{30} =$	$\left(x_6 + \frac{1}{2}\right) \mathbf{a}_1 + \left(y_6 + \frac{1}{2}\right) \mathbf{a}_2 - z_6 \mathbf{a}_3$	$=$	$a\left(x_6 + \frac{1}{2}\right) \hat{\mathbf{x}} + a\left(y_6 + \frac{1}{2}\right) \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{31} =$	$\left(y_6 + \frac{1}{2}\right) \mathbf{a}_1 - x_6 \mathbf{a}_2 - z_6 \mathbf{a}_3$	$=$	$a\left(y_6 + \frac{1}{2}\right) \hat{\mathbf{x}} - ax_6 \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{32} =$	$-y_6 \mathbf{a}_1 + \left(x_6 + \frac{1}{2}\right) \mathbf{a}_2 - z_6 \mathbf{a}_3$	$=$	$-ay_6 \hat{\mathbf{x}} + a\left(x_6 + \frac{1}{2}\right) \hat{\mathbf{y}} - cz_6 \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{33} =$	$x_6 \mathbf{a}_1 - \left(y_6 - \frac{1}{2}\right) \mathbf{a}_2 + \left(z_6 + \frac{1}{2}\right) \mathbf{a}_3$	$=$	$ax_6 \hat{\mathbf{x}} - a\left(y_6 - \frac{1}{2}\right) \hat{\mathbf{y}} + c\left(z_6 + \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{34} =$	$-\left(x_6 - \frac{1}{2}\right) \mathbf{a}_1 + y_6 \mathbf{a}_2 +$ $\left(z_6 + \frac{1}{2}\right) \mathbf{a}_3$	$=$	$-a\left(x_6 - \frac{1}{2}\right) \hat{\mathbf{x}} + ay_6 \hat{\mathbf{y}} + c\left(z_6 + \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{35} =$	$-\left(y_6 - \frac{1}{2}\right) \mathbf{a}_1 - \left(x_6 - \frac{1}{2}\right) \mathbf{a}_2 +$ $\left(z_6 + \frac{1}{2}\right) \mathbf{a}_3$	$=$	$-a\left(y_6 - \frac{1}{2}\right) \hat{\mathbf{x}} - a\left(x_6 - \frac{1}{2}\right) \hat{\mathbf{y}} + c\left(z_6 + \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{36} =$	$y_6 \mathbf{a}_1 + x_6 \mathbf{a}_2 + \left(z_6 + \frac{1}{2}\right) \mathbf{a}_3$	$=$	$ay_6 \hat{\mathbf{x}} + ax_6 \hat{\mathbf{y}} + c\left(z_6 + \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H III
$\mathbf{B}_{37} =$	$x_7 \mathbf{a}_1 + y_7 \mathbf{a}_2 + z_7 \mathbf{a}_3$	$=$	$ax_7 \hat{\mathbf{x}} + ay_7 \hat{\mathbf{y}} + cz_7 \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{38} =$	$-\left(x_7 - \frac{1}{2}\right) \mathbf{a}_1 - \left(y_7 - \frac{1}{2}\right) \mathbf{a}_2 +$ $z_7 \mathbf{a}_3$	$=$	$-a\left(x_7 - \frac{1}{2}\right) \hat{\mathbf{x}} - a\left(y_7 - \frac{1}{2}\right) \hat{\mathbf{y}} + cz_7 \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{39} =$	$-\left(y_7 - \frac{1}{2}\right) \mathbf{a}_1 + x_7 \mathbf{a}_2 + z_7 \mathbf{a}_3$	$=$	$-a\left(y_7 - \frac{1}{2}\right) \hat{\mathbf{x}} + ax_7 \hat{\mathbf{y}} + cz_7 \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{40} =$	$y_7 \mathbf{a}_1 - \left(x_7 - \frac{1}{2}\right) \mathbf{a}_2 + z_7 \mathbf{a}_3$	$=$	$ay_7 \hat{\mathbf{x}} - a\left(x_7 - \frac{1}{2}\right) \hat{\mathbf{y}} + cz_7 \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{41} =$	$-x_7 \mathbf{a}_1 + \left(y_7 + \frac{1}{2}\right) \mathbf{a}_2 -$ $\left(z_7 - \frac{1}{2}\right) \mathbf{a}_3$	$=$	$-ax_7 \hat{\mathbf{x}} + a\left(y_7 + \frac{1}{2}\right) \hat{\mathbf{y}} - c\left(z_7 - \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{42} =$	$\left(x_7 + \frac{1}{2}\right) \mathbf{a}_1 - y_7 \mathbf{a}_2 - \left(z_7 - \frac{1}{2}\right) \mathbf{a}_3$	$=$	$a\left(x_7 + \frac{1}{2}\right) \hat{\mathbf{x}} - ay_7 \hat{\mathbf{y}} - c\left(z_7 - \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{43} =$	$\left(y_7 + \frac{1}{2}\right) \mathbf{a}_1 + \left(x_7 + \frac{1}{2}\right) \mathbf{a}_2 -$ $\left(z_7 - \frac{1}{2}\right) \mathbf{a}_3$	$=$	$a\left(y_7 + \frac{1}{2}\right) \hat{\mathbf{x}} + a\left(x_7 + \frac{1}{2}\right) \hat{\mathbf{y}} - c\left(z_7 - \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{44} =$	$-y_7 \mathbf{a}_1 - x_7 \mathbf{a}_2 - \left(z_7 - \frac{1}{2}\right) \mathbf{a}_3$	$=$	$-ay_7 \hat{\mathbf{x}} - ax_7 \hat{\mathbf{y}} - c\left(z_7 - \frac{1}{2}\right) \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{45} =$	$-x_7 \mathbf{a}_1 - y_7 \mathbf{a}_2 - z_7 \mathbf{a}_3$	$=$	$-ax_7 \hat{\mathbf{x}} - ay_7 \hat{\mathbf{y}} - cz_7 \hat{\mathbf{z}}$	$(16g)$	H IV
$\mathbf{B}_{46} =$	$\left(x_7 + \frac{1}{2}\right) \mathbf{a}_1 + \left(y_7 + \frac{1}{2}\right) \mathbf{a}_2 - z_7 \mathbf{a}_3$	$=$	$a\left(x_7 + \frac{1}{2}\right) \hat{\mathbf{x}} + a\left(y_7 + \frac{1$		

$$\begin{aligned}
\mathbf{B}_{90} &= \begin{pmatrix} (x_{10} + \frac{1}{2}) \mathbf{a}_1 - y_{10} \mathbf{a}_2 - \\ (z_{10} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (x_{10} + \frac{1}{2}) \hat{\mathbf{x}} - ay_{10} \hat{\mathbf{y}} - c(z_{10} - \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O III} \\
\mathbf{B}_{91} &= \begin{pmatrix} (y_{10} + \frac{1}{2}) \mathbf{a}_1 + (x_{10} + \frac{1}{2}) \mathbf{a}_2 - \\ (z_{10} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} a(y_{10} + \frac{1}{2}) \hat{\mathbf{x}} + a(x_{10} + \frac{1}{2}) \hat{\mathbf{y}} - \\ c(z_{10} - \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O III} \\
\mathbf{B}_{92} &= -y_{10} \mathbf{a}_1 - x_{10} \mathbf{a}_2 - (z_{10} - \frac{1}{2}) \mathbf{a}_3 = -ay_{10} \hat{\mathbf{x}} - ax_{10} \hat{\mathbf{y}} - c(z_{10} - \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O III} \\
\mathbf{B}_{93} &= -x_{10} \mathbf{a}_1 - y_{10} \mathbf{a}_2 - z_{10} \mathbf{a}_3 = -ax_{10} \hat{\mathbf{x}} - ay_{10} \hat{\mathbf{y}} - cz_{10} \hat{\mathbf{z}} & (16g) & \text{O III} \\
\mathbf{B}_{94} &= \begin{pmatrix} (x_{10} + \frac{1}{2}) \mathbf{a}_1 + (y_{10} + \frac{1}{2}) \mathbf{a}_2 - \\ z_{10} \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (x_{10} + \frac{1}{2}) \hat{\mathbf{x}} + a(y_{10} + \frac{1}{2}) \hat{\mathbf{y}} - cz_{10} \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O III} \\
\mathbf{B}_{95} &= \begin{pmatrix} (y_{10} + \frac{1}{2}) \mathbf{a}_1 - x_{10} \mathbf{a}_2 - z_{10} \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_{10} + \frac{1}{2}) \hat{\mathbf{x}} - ax_{10} \hat{\mathbf{y}} - cz_{10} \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O III} \\
\mathbf{B}_{96} &= -y_{10} \mathbf{a}_1 + (x_{10} + \frac{1}{2}) \mathbf{a}_2 - z_{10} \mathbf{a}_3 = -ay_{10} \hat{\mathbf{x}} + a(x_{10} + \frac{1}{2}) \hat{\mathbf{y}} - cz_{10} \hat{\mathbf{z}} & (16g) & \text{O III} \\
\mathbf{B}_{97} &= \begin{pmatrix} x_{10} \mathbf{a}_1 - (y_{10} - \frac{1}{2}) \mathbf{a}_2 + \\ (z_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = ax_{10} \hat{\mathbf{x}} - a(y_{10} - \frac{1}{2}) \hat{\mathbf{y}} + c(z_{10} + \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O III} \\
\mathbf{B}_{98} &= \begin{pmatrix} -(x_{10} - \frac{1}{2}) \mathbf{a}_1 + y_{10} \mathbf{a}_2 + \\ (z_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(x_{10} - \frac{1}{2}) \hat{\mathbf{x}} + ay_{10} \hat{\mathbf{y}} + c(z_{10} + \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O III} \\
\mathbf{B}_{99} &= \begin{pmatrix} -(y_{10} - \frac{1}{2}) \mathbf{a}_1 - (x_{10} - \frac{1}{2}) \mathbf{a}_2 + \\ (z_{10} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} -a(y_{10} - \frac{1}{2}) \hat{\mathbf{x}} - a(x_{10} - \frac{1}{2}) \hat{\mathbf{y}} + \\ c(z_{10} + \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O III} \\
\mathbf{B}_{100} &= y_{10} \mathbf{a}_1 + x_{10} \mathbf{a}_2 + (z_{10} + \frac{1}{2}) \mathbf{a}_3 = ay_{10} \hat{\mathbf{x}} + ax_{10} \hat{\mathbf{y}} + c(z_{10} + \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O III} \\
\mathbf{B}_{101} &= x_{11} \mathbf{a}_1 + y_{11} \mathbf{a}_2 + z_{11} \mathbf{a}_3 = ax_{11} \hat{\mathbf{x}} + ay_{11} \hat{\mathbf{y}} + cz_{11} \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{102} &= \begin{pmatrix} -(x_{11} - \frac{1}{2}) \mathbf{a}_1 - (y_{11} - \frac{1}{2}) \mathbf{a}_2 + \\ z_{11} \mathbf{a}_3 \end{pmatrix} = -a(x_{11} - \frac{1}{2}) \hat{\mathbf{x}} - a(y_{11} - \frac{1}{2}) \hat{\mathbf{y}} + cz_{11} \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{103} &= \begin{pmatrix} -(y_{11} - \frac{1}{2}) \mathbf{a}_1 + x_{11} \mathbf{a}_2 + z_{11} \mathbf{a}_3 \end{pmatrix} = -a(y_{11} - \frac{1}{2}) \hat{\mathbf{x}} + ax_{11} \hat{\mathbf{y}} + cz_{11} \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{104} &= y_{11} \mathbf{a}_1 - (x_{11} - \frac{1}{2}) \mathbf{a}_2 + z_{11} \mathbf{a}_3 = ay_{11} \hat{\mathbf{x}} - a(x_{11} - \frac{1}{2}) \hat{\mathbf{y}} + cz_{11} \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{105} &= \begin{pmatrix} -x_{11} \mathbf{a}_1 + (y_{11} + \frac{1}{2}) \mathbf{a}_2 - \\ (z_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -ax_{11} \hat{\mathbf{x}} + a(y_{11} + \frac{1}{2}) \hat{\mathbf{y}} - c(z_{11} - \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{106} &= \begin{pmatrix} (x_{11} + \frac{1}{2}) \mathbf{a}_1 - y_{11} \mathbf{a}_2 - \\ (z_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (x_{11} + \frac{1}{2}) \hat{\mathbf{x}} - ay_{11} \hat{\mathbf{y}} - c(z_{11} - \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O IV} \\
\mathbf{B}_{107} &= \begin{pmatrix} (y_{11} + \frac{1}{2}) \mathbf{a}_1 + (x_{11} + \frac{1}{2}) \mathbf{a}_2 - \\ (z_{11} - \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} a(y_{11} + \frac{1}{2}) \hat{\mathbf{x}} + a(x_{11} + \frac{1}{2}) \hat{\mathbf{y}} - \\ c(z_{11} - \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O IV} \\
\mathbf{B}_{108} &= -y_{11} \mathbf{a}_1 - x_{11} \mathbf{a}_2 - (z_{11} - \frac{1}{2}) \mathbf{a}_3 = -ay_{11} \hat{\mathbf{x}} - ax_{11} \hat{\mathbf{y}} - c(z_{11} - \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{109} &= -x_{11} \mathbf{a}_1 - y_{11} \mathbf{a}_2 - z_{11} \mathbf{a}_3 = -ax_{11} \hat{\mathbf{x}} - ay_{11} \hat{\mathbf{y}} - cz_{11} \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{110} &= \begin{pmatrix} (x_{11} + \frac{1}{2}) \mathbf{a}_1 + (y_{11} + \frac{1}{2}) \mathbf{a}_2 - \\ z_{11} \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (x_{11} + \frac{1}{2}) \hat{\mathbf{x}} + a(y_{11} + \frac{1}{2}) \hat{\mathbf{y}} - cz_{11} \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O IV} \\
\mathbf{B}_{111} &= \begin{pmatrix} (y_{11} + \frac{1}{2}) \mathbf{a}_1 - x_{11} \mathbf{a}_2 - z_{11} \mathbf{a}_3 \end{pmatrix} = a \begin{pmatrix} (y_{11} + \frac{1}{2}) \hat{\mathbf{x}} - ax_{11} \hat{\mathbf{y}} - cz_{11} \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O IV} \\
\mathbf{B}_{112} &= -y_{11} \mathbf{a}_1 + (x_{11} + \frac{1}{2}) \mathbf{a}_2 - z_{11} \mathbf{a}_3 = -ay_{11} \hat{\mathbf{x}} + a(x_{11} + \frac{1}{2}) \hat{\mathbf{y}} - cz_{11} \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{113} &= \begin{pmatrix} x_{11} \mathbf{a}_1 - (y_{11} - \frac{1}{2}) \mathbf{a}_2 + \\ (z_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = ax_{11} \hat{\mathbf{x}} - a(y_{11} - \frac{1}{2}) \hat{\mathbf{y}} + c(z_{11} + \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{114} &= \begin{pmatrix} -(x_{11} - \frac{1}{2}) \mathbf{a}_1 + y_{11} \mathbf{a}_2 + \\ (z_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = -a(x_{11} - \frac{1}{2}) \hat{\mathbf{x}} + ay_{11} \hat{\mathbf{y}} + c(z_{11} + \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O IV} \\
\mathbf{B}_{115} &= \begin{pmatrix} -(y_{11} - \frac{1}{2}) \mathbf{a}_1 - (x_{11} - \frac{1}{2}) \mathbf{a}_2 + \\ (z_{11} + \frac{1}{2}) \mathbf{a}_3 \end{pmatrix} = \begin{pmatrix} -a(y_{11} - \frac{1}{2}) \hat{\mathbf{x}} - a(x_{11} - \frac{1}{2}) \hat{\mathbf{y}} + \\ c(z_{11} + \frac{1}{2}) \hat{\mathbf{z}} \end{pmatrix} & (16g) & \text{O IV} \\
\mathbf{B}_{116} &= y_{11} \mathbf{a}_1 + x_{11} \mathbf{a}_2 + (z_{11} + \frac{1}{2}) \mathbf{a}_3 = ay_{11} \hat{\mathbf{x}} + ax_{11} \hat{\mathbf{y}} + c(z_{11} + \frac{1}{2}) \hat{\mathbf{z}} & (16g) & \text{O IV}
\end{aligned}$$

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First cited in

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