CaB_2O_4 (IV) Structure: A2BC4_cP84_205_d_ac_2d-001

This structure originally had the label `A2BC4_cP84_205_d_ac_2d`. Calls to that address will be redirected here.

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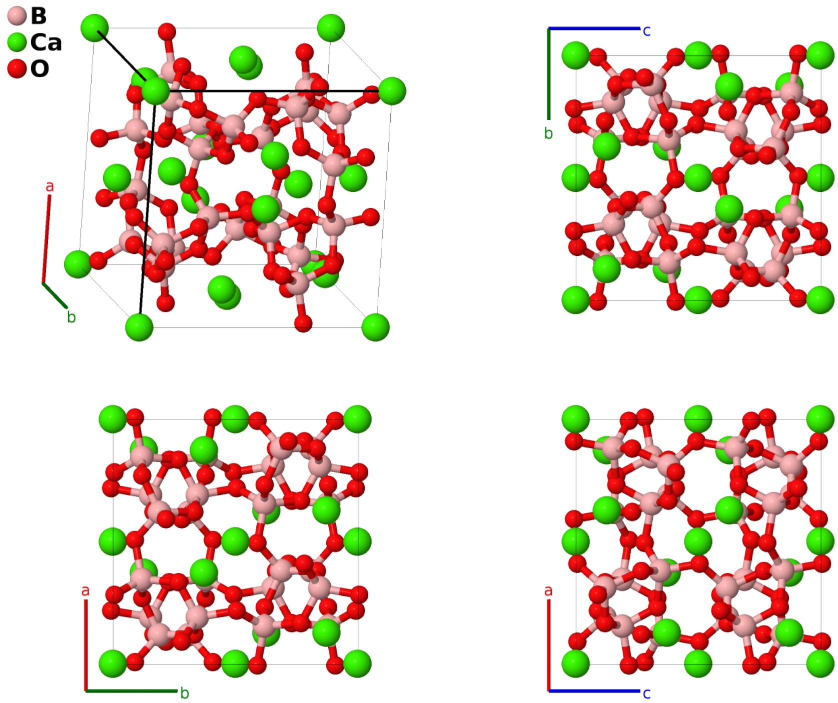
https://aflow.org/p/TZRB

https://aflow.org/p/A2BC4_cP84_205_d_ac_2d-001



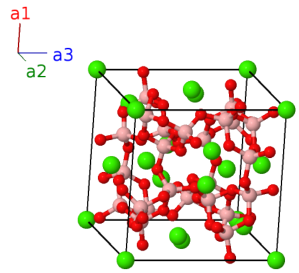
Prototype	B_2CaO_4
AFLOW prototype label	A2BC4_cP84_205_d_ac_2d-001
ICSD	23241
Pearson symbol	cP84
Space group number	205
Space group symbol	$Pa\overline{3}$
AFLOW prototype command	`aflow --proto=A2BC4_cP84_205_d_ac_2d-001` `--params=`$a, x_2, x_3, y_3, z_3, x_4, y_4, z_4, x_5, y_5, z_5$

- CaB_2O_4 exists in at least four phase (Marezio, 1969):
  - The ground state, stable below 1.2 GPa, *Strukturbericht* $E3_2$
  - Orthorhombic high pressure structure, stable between 1.2 and 1.5 GPa, presumably Calciborite
  - Orthorhombic high pressure structure, stable between 1.5 and 2.5 GPa

– Cubic high pressure structure, stable between 2.5 and 4.0 GPa (this structure)

Simple Cubic primitive vectors

$$\mathbf{a_1} = a\,\hat{\mathbf{x}}$$
$$\mathbf{a_2} = a\,\hat{\mathbf{y}}$$
$$\mathbf{a_3} = a\,\hat{\mathbf{z}}$$



Basis vectors

		Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B_1}$	=	0	=	0	(4a)	Ca I
$\mathbf{B_2}$	=	$\frac{1}{2}\,\mathbf{a}_1 + \frac{1}{2}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} + \frac{1}{2}a\,\hat{\mathbf{z}}$	(4a)	Ca I
$\mathbf{B_3}$	=	$\frac{1}{2}\,\mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{y}} + \frac{1}{2}a\,\hat{\mathbf{z}}$	(4a)	Ca I
$\mathbf{B_4}$	=	$\frac{1}{2}\,\mathbf{a}_1 + \frac{1}{2}\,\mathbf{a}_2$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} + \frac{1}{2}a\,\hat{\mathbf{y}}$	(4a)	Ca I
$\mathbf{B_5}$	=	$x_2\,\mathbf{a}_1 + x_2\,\mathbf{a}_2 + x_2\,\mathbf{a}_3$	=	$ax_2\,\hat{\mathbf{x}} + ax_2\,\hat{\mathbf{y}} + ax_2\,\hat{\mathbf{z}}$	(8c)	Ca II
$\mathbf{B_6}$	=	$-\left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_1 - x_2\,\mathbf{a}_2 + \left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{x}} - ax_2\,\hat{\mathbf{y}} + a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(8c)	Ca II
$\mathbf{B_7}$	=	$-x_2\,\mathbf{a}_1 + \left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_2\,\hat{\mathbf{x}} + a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{y}} - a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(8c)	Ca II
$\mathbf{B_8}$	=	$\left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_2 - x_2\,\mathbf{a}_3$	=	$a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{y}} - ax_2\,\hat{\mathbf{z}}$	(8c)	Ca II
$\mathbf{B_9}$	=	$-x_2\,\mathbf{a}_1 - x_2\,\mathbf{a}_2 - x_2\,\mathbf{a}_3$	=	$-ax_2\,\hat{\mathbf{x}} - ax_2\,\hat{\mathbf{y}} - ax_2\,\hat{\mathbf{z}}$	(8c)	Ca II
$\mathbf{B_{10}}$	=	$\left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_1 + x_2\,\mathbf{a}_2 - \left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + ax_2\,\hat{\mathbf{y}} - a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(8c)	Ca II
$\mathbf{B_{11}}$	=	$x_2\,\mathbf{a}_1 - \left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$ax_2\,\hat{\mathbf{x}} - a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{y}} + a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(8c)	Ca II
$\mathbf{B_{12}}$	=	$-\left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_2 + x_2\,\mathbf{a}_3$	=	$-a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{y}} + ax_2\,\hat{\mathbf{z}}$	(8c)	Ca II
$\mathbf{B_{13}}$	=	$x_3\,\mathbf{a}_1 + y_3\,\mathbf{a}_2 + z_3\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}} + ay_3\,\hat{\mathbf{y}} + az_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{14}}$	=	$-\left(x_3 - \frac{1}{2}\right)\,\mathbf{a}_1 - y_3\,\mathbf{a}_2 + \left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_3 - \frac{1}{2}\right)\,\hat{\mathbf{x}} - ay_3\,\hat{\mathbf{y}} + a\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{15}}$	=	$-x_3\,\mathbf{a}_1 + \left(y_3 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(z_3 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}} + a\left(y_3 + \frac{1}{2}\right)\,\hat{\mathbf{y}} - a\left(z_3 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{16}}$	=	$\left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(y_3 - \frac{1}{2}\right)\,\mathbf{a}_2 - z_3\,\mathbf{a}_3$	=	$a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - a\left(y_3 - \frac{1}{2}\right)\,\hat{\mathbf{y}} - az_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{17}}$	=	$z_3\,\mathbf{a}_1 + x_3\,\mathbf{a}_2 + y_3\,\mathbf{a}_3$	=	$az_3\,\hat{\mathbf{x}} + ax_3\,\hat{\mathbf{y}} + ay_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{18}}$	=	$\left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(x_3 - \frac{1}{2}\right)\,\mathbf{a}_2 - y_3\,\mathbf{a}_3$	=	$a\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - a\left(x_3 - \frac{1}{2}\right)\,\hat{\mathbf{y}} - ay_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{19}}$	=	$-\left(z_3 - \frac{1}{2}\right)\,\mathbf{a}_1 - x_3\,\mathbf{a}_2 + \left(y_3 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(z_3 - \frac{1}{2}\right)\,\hat{\mathbf{x}} - ax_3\,\hat{\mathbf{y}} + a\left(y_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{20}}$	=	$-z_3\,\mathbf{a}_1 + \left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(y_3 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-az_3\,\hat{\mathbf{x}} + a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{y}} - a\left(y_3 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{21}}$	=	$y_3\,\mathbf{a}_1 + z_3\,\mathbf{a}_2 + x_3\,\mathbf{a}_3$	=	$ay_3\,\hat{\mathbf{x}} + az_3\,\hat{\mathbf{y}} + ax_3\,\hat{\mathbf{z}}$	(24d)	B I

$\mathbf{B_{22}}$	=	$-y_3\,\mathbf{a}_1 + \left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(x_3 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ay_3\,\hat{\mathbf{x}} + a\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{y}} - a\left(x_3 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{23}}$	=	$\left(y_3 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(z_3 - \frac{1}{2}\right)\,\mathbf{a}_2 - x_3\,\mathbf{a}_3$	=	$a\left(y_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - a\left(z_3 - \frac{1}{2}\right)\,\hat{\mathbf{y}} - ax_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{24}}$	=	$-\left(y_3 - \frac{1}{2}\right)\,\mathbf{a}_1 - z_3\,\mathbf{a}_2 + \left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(y_3 - \frac{1}{2}\right)\,\hat{\mathbf{x}} - az_3\,\hat{\mathbf{y}} + a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{25}}$	=	$-x_3\,\mathbf{a}_1 - y_3\,\mathbf{a}_2 - z_3\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}} - ay_3\,\hat{\mathbf{y}} - az_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{26}}$	=	$\left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_1 + y_3\,\mathbf{a}_2 - \left(z_3 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + ay_3\,\hat{\mathbf{y}} - a\left(z_3 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{27}}$	=	$x_3\,\mathbf{a}_1 - \left(y_3 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}} - a\left(y_3 - \frac{1}{2}\right)\,\hat{\mathbf{y}} + a\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{28}}$	=	$-\left(x_3 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(y_3 + \frac{1}{2}\right)\,\mathbf{a}_2 + z_3\,\mathbf{a}_3$	=	$-a\left(x_3 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + a\left(y_3 + \frac{1}{2}\right)\,\hat{\mathbf{y}} + az_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{29}}$	=	$-z_3\,\mathbf{a}_1 - x_3\,\mathbf{a}_2 - y_3\,\mathbf{a}_3$	=	$-az_3\,\hat{\mathbf{x}} - ax_3\,\hat{\mathbf{y}} - ay_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{30}}$	=	$-\left(z_3 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_2 + y_3\,\mathbf{a}_3$	=	$-a\left(z_3 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{y}} + ay_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{31}}$	=	$\left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_1 + x_3\,\mathbf{a}_2 - \left(y_3 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + ax_3\,\hat{\mathbf{y}} - a\left(y_3 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{32}}$	=	$z_3\,\mathbf{a}_1 - \left(x_3 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(y_3 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$az_3\,\hat{\mathbf{x}} - a\left(x_3 - \frac{1}{2}\right)\,\hat{\mathbf{y}} + a\left(y_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{33}}$	=	$-y_3\,\mathbf{a}_1 - z_3\,\mathbf{a}_2 - x_3\,\mathbf{a}_3$	=	$-ay_3\,\hat{\mathbf{x}} - az_3\,\hat{\mathbf{y}} - ax_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{34}}$	=	$y_3\,\mathbf{a}_1 - \left(z_3 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$ay_3\,\hat{\mathbf{x}} - a\left(z_3 - \frac{1}{2}\right)\,\hat{\mathbf{y}} + a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{35}}$	=	$-\left(y_3 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_2 + x_3\,\mathbf{a}_3$	=	$-a\left(y_3 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + a\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{y}} + ax_3\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{36}}$	=	$\left(y_3 + \frac{1}{2}\right)\,\mathbf{a}_1 + z_3\,\mathbf{a}_2 - \left(x_3 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(y_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + az_3\,\hat{\mathbf{y}} - a\left(x_3 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	B I
$\mathbf{B_{37}}$	=	$x_4\,\mathbf{a}_1 + y_4\,\mathbf{a}_2 + z_4\,\mathbf{a}_3$	=	$ax_4\,\hat{\mathbf{x}} + ay_4\,\hat{\mathbf{y}} + az_4\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{38}}$	=	$-\left(x_4 - \frac{1}{2}\right)\,\mathbf{a}_1 - y_4\,\mathbf{a}_2 + \left(z_4 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_4 - \frac{1}{2}\right)\,\hat{\mathbf{x}} - ay_4\,\hat{\mathbf{y}} + a\left(z_4 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{39}}$	=	$-x_4\,\mathbf{a}_1 + \left(y_4 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(z_4 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_4\,\hat{\mathbf{x}} + a\left(y_4 + \frac{1}{2}\right)\,\hat{\mathbf{y}} - a\left(z_4 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{40}}$	=	$\left(x_4 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(y_4 - \frac{1}{2}\right)\,\mathbf{a}_2 - z_4\,\mathbf{a}_3$	=	$a\left(x_4 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - a\left(y_4 - \frac{1}{2}\right)\,\hat{\mathbf{y}} - az_4\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{41}}$	=	$z_4\,\mathbf{a}_1 + x_4\,\mathbf{a}_2 + y_4\,\mathbf{a}_3$	=	$az_4\,\hat{\mathbf{x}} + ax_4\,\hat{\mathbf{y}} + ay_4\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{42}}$	=	$\left(z_4 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(x_4 - \frac{1}{2}\right)\,\mathbf{a}_2 - y_4\,\mathbf{a}_3$	=	$a\left(z_4 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - a\left(x_4 - \frac{1}{2}\right)\,\hat{\mathbf{y}} - ay_4\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{43}}$	=	$-\left(z_4 - \frac{1}{2}\right)\,\mathbf{a}_1 - x_4\,\mathbf{a}_2 + \left(y_4 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(z_4 - \frac{1}{2}\right)\,\hat{\mathbf{x}} - ax_4\,\hat{\mathbf{y}} + a\left(y_4 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{44}}$	=	$-z_4\,\mathbf{a}_1 + \left(x_4 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(y_4 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-az_4\,\hat{\mathbf{x}} + a\left(x_4 + \frac{1}{2}\right)\,\hat{\mathbf{y}} - a\left(y_4 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{45}}$	=	$y_4\,\mathbf{a}_1 + z_4\,\mathbf{a}_2 + x_4\,\mathbf{a}_3$	=	$ay_4\,\hat{\mathbf{x}} + az_4\,\hat{\mathbf{y}} + ax_4\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{46}}$	=	$-y_4\,\mathbf{a}_1 + \left(z_4 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(x_4 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ay_4\,\hat{\mathbf{x}} + a\left(z_4 + \frac{1}{2}\right)\,\hat{\mathbf{y}} - a\left(x_4 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{47}}$	=	$\left(y_4 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(z_4 - \frac{1}{2}\right)\,\mathbf{a}_2 - x_4\,\mathbf{a}_3$	=	$a\left(y_4 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - a\left(z_4 - \frac{1}{2}\right)\,\hat{\mathbf{y}} - ax_4\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{48}}$	=	$-\left(y_4 - \frac{1}{2}\right)\,\mathbf{a}_1 - z_4\,\mathbf{a}_2 + \left(x_4 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(y_4 - \frac{1}{2}\right)\,\hat{\mathbf{x}} - az_4\,\hat{\mathbf{y}} + a\left(x_4 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{49}}$	=	$-x_4\,\mathbf{a}_1 - y_4\,\mathbf{a}_2 - z_4\,\mathbf{a}_3$	=	$-ax_4\,\hat{\mathbf{x}} - ay_4\,\hat{\mathbf{y}} - az_4\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{50}}$	=	$\left(x_4 + \frac{1}{2}\right)\,\mathbf{a}_1 + y_4\,\mathbf{a}_2 - \left(z_4 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(x_4 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + ay_4\,\hat{\mathbf{y}} - a\left(z_4 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{51}}$	=	$x_4\,\mathbf{a}_1 - \left(y_4 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(z_4 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$ax_4\,\hat{\mathbf{x}} - a\left(y_4 - \frac{1}{2}\right)\,\hat{\mathbf{y}} + a\left(z_4 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{52}}$	=	$-\left(x_4 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(y_4 + \frac{1}{2}\right)\,\mathbf{a}_2 + z_4\,\mathbf{a}_3$	=	$-a\left(x_4 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + a\left(y_4 + \frac{1}{2}\right)\,\hat{\mathbf{y}} + az_4\,\hat{\mathbf{z}}$	(24d)	O I
$\mathbf{B_{53}}$	=	$-z_4\,\mathbf{a}_1 - x_4\,\mathbf{a}_2 - y_4\,\mathbf{a}_3$	=	$-az_4\,\hat{\mathbf{x}} - ax_4\,\hat{\mathbf{y}} - ay_4\,\hat{\mathbf{z}}$	(24d)	O I

$\mathbf{B_{54}}$	=	$-\left(z_4 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(x_4 + \frac{1}{2}\right)\,\mathbf{a}_2 + y_4\,\mathbf{a}_3$	=	$-a\left(z_4 - \frac{1}{2}\right)\,\mathbf{\hat{x}} + a\left(x_4 + \frac{1}{2}\right)\,\mathbf{\hat{y}} + ay_4\,\mathbf{\hat{z}}$	(24d)	O I
$\mathbf{B_{55}}$	=	$\left(z_4 + \frac{1}{2}\right)\,\mathbf{a}_1 + x_4\,\mathbf{a}_2 - \left(y_4 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(z_4 + \frac{1}{2}\right)\,\mathbf{\hat{x}} + ax_4\,\mathbf{\hat{y}} - a\left(y_4 - \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O I
$\mathbf{B_{56}}$	=	$z_4\,\mathbf{a}_1 - \left(x_4 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(y_4 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$az_4\,\mathbf{\hat{x}} - a\left(x_4 - \frac{1}{2}\right)\,\mathbf{\hat{y}} + a\left(y_4 + \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O I
$\mathbf{B_{57}}$	=	$-y_4\,\mathbf{a}_1 - z_4\,\mathbf{a}_2 - x_4\,\mathbf{a}_3$	=	$-ay_4\,\mathbf{\hat{x}} - az_4\,\mathbf{\hat{y}} - ax_4\,\mathbf{\hat{z}}$	(24d)	O I
$\mathbf{B_{58}}$	=	$y_4\,\mathbf{a}_1 - \left(z_4 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(x_4 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$ay_4\,\mathbf{\hat{x}} - a\left(z_4 - \frac{1}{2}\right)\,\mathbf{\hat{y}} + a\left(x_4 + \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O I
$\mathbf{B_{59}}$	=	$-\left(y_4 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(z_4 + \frac{1}{2}\right)\,\mathbf{a}_2 + x_4\,\mathbf{a}_3$	=	$-a\left(y_4 - \frac{1}{2}\right)\,\mathbf{\hat{x}} + a\left(z_4 + \frac{1}{2}\right)\,\mathbf{\hat{y}} + ax_4\,\mathbf{\hat{z}}$	(24d)	O I
$\mathbf{B_{60}}$	=	$\left(y_4 + \frac{1}{2}\right)\,\mathbf{a}_1 + z_4\,\mathbf{a}_2 - \left(x_4 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(y_4 + \frac{1}{2}\right)\,\mathbf{\hat{x}} + az_4\,\mathbf{\hat{y}} - a\left(x_4 - \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O I
$\mathbf{B_{61}}$	=	$x_5\,\mathbf{a}_1 + y_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$ax_5\,\mathbf{\hat{x}} + ay_5\,\mathbf{\hat{y}} + az_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{62}}$	=	$-\left(x_5 - \frac{1}{2}\right)\,\mathbf{a}_1 - y_5\,\mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_5 - \frac{1}{2}\right)\,\mathbf{\hat{x}} - ay_5\,\mathbf{\hat{y}} + a\left(z_5 + \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{63}}$	=	$-x_5\,\mathbf{a}_1 + \left(y_5 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_5\,\mathbf{\hat{x}} + a\left(y_5 + \frac{1}{2}\right)\,\mathbf{\hat{y}} - a\left(z_5 - \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{64}}$	=	$\left(x_5 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(y_5 - \frac{1}{2}\right)\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$a\left(x_5 + \frac{1}{2}\right)\,\mathbf{\hat{x}} - a\left(y_5 - \frac{1}{2}\right)\,\mathbf{\hat{y}} - az_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{65}}$	=	$z_5\,\mathbf{a}_1 + x_5\,\mathbf{a}_2 + y_5\,\mathbf{a}_3$	=	$az_5\,\mathbf{\hat{x}} + ax_5\,\mathbf{\hat{y}} + ay_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{66}}$	=	$\left(z_5 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(x_5 - \frac{1}{2}\right)\,\mathbf{a}_2 - y_5\,\mathbf{a}_3$	=	$a\left(z_5 + \frac{1}{2}\right)\,\mathbf{\hat{x}} - a\left(x_5 - \frac{1}{2}\right)\,\mathbf{\hat{y}} - ay_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{67}}$	=	$-\left(z_5 - \frac{1}{2}\right)\,\mathbf{a}_1 - x_5\,\mathbf{a}_2 + \left(y_5 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(z_5 - \frac{1}{2}\right)\,\mathbf{\hat{x}} - ax_5\,\mathbf{\hat{y}} + a\left(y_5 + \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{68}}$	=	$-z_5\,\mathbf{a}_1 + \left(x_5 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(y_5 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-az_5\,\mathbf{\hat{x}} + a\left(x_5 + \frac{1}{2}\right)\,\mathbf{\hat{y}} - a\left(y_5 - \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{69}}$	=	$y_5\,\mathbf{a}_1 + z_5\,\mathbf{a}_2 + x_5\,\mathbf{a}_3$	=	$ay_5\,\mathbf{\hat{x}} + az_5\,\mathbf{\hat{y}} + ax_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{70}}$	=	$-y_5\,\mathbf{a}_1 + \left(z_5 + \frac{1}{2}\right)\,\mathbf{a}_2 - \left(x_5 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ay_5\,\mathbf{\hat{x}} + a\left(z_5 + \frac{1}{2}\right)\,\mathbf{\hat{y}} - a\left(x_5 - \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{71}}$	=	$\left(y_5 + \frac{1}{2}\right)\,\mathbf{a}_1 - \left(z_5 - \frac{1}{2}\right)\,\mathbf{a}_2 - x_5\,\mathbf{a}_3$	=	$a\left(y_5 + \frac{1}{2}\right)\,\mathbf{\hat{x}} - a\left(z_5 - \frac{1}{2}\right)\,\mathbf{\hat{y}} - ax_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{72}}$	=	$-\left(y_5 - \frac{1}{2}\right)\,\mathbf{a}_1 - z_5\,\mathbf{a}_2 + \left(x_5 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(y_5 - \frac{1}{2}\right)\,\mathbf{\hat{x}} - az_5\,\mathbf{\hat{y}} + a\left(x_5 + \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{73}}$	=	$-x_5\,\mathbf{a}_1 - y_5\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$-ax_5\,\mathbf{\hat{x}} - ay_5\,\mathbf{\hat{y}} - az_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{74}}$	=	$\left(x_5 + \frac{1}{2}\right)\,\mathbf{a}_1 + y_5\,\mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(x_5 + \frac{1}{2}\right)\,\mathbf{\hat{x}} + ay_5\,\mathbf{\hat{y}} - a\left(z_5 - \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{75}}$	=	$x_5\,\mathbf{a}_1 - \left(y_5 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$ax_5\,\mathbf{\hat{x}} - a\left(y_5 - \frac{1}{2}\right)\,\mathbf{\hat{y}} + a\left(z_5 + \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{76}}$	=	$-\left(x_5 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(y_5 + \frac{1}{2}\right)\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$-a\left(x_5 - \frac{1}{2}\right)\,\mathbf{\hat{x}} + a\left(y_5 + \frac{1}{2}\right)\,\mathbf{\hat{y}} + az_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{77}}$	=	$-z_5\,\mathbf{a}_1 - x_5\,\mathbf{a}_2 - y_5\,\mathbf{a}_3$	=	$-az_5\,\mathbf{\hat{x}} - ax_5\,\mathbf{\hat{y}} - ay_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{78}}$	=	$-\left(z_5 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(x_5 + \frac{1}{2}\right)\,\mathbf{a}_2 + y_5\,\mathbf{a}_3$	=	$-a\left(z_5 - \frac{1}{2}\right)\,\mathbf{\hat{x}} + a\left(x_5 + \frac{1}{2}\right)\,\mathbf{\hat{y}} + ay_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{79}}$	=	$\left(z_5 + \frac{1}{2}\right)\,\mathbf{a}_1 + x_5\,\mathbf{a}_2 - \left(y_5 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(z_5 + \frac{1}{2}\right)\,\mathbf{\hat{x}} + ax_5\,\mathbf{\hat{y}} - a\left(y_5 - \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{80}}$	=	$z_5\,\mathbf{a}_1 - \left(x_5 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(y_5 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$az_5\,\mathbf{\hat{x}} - a\left(x_5 - \frac{1}{2}\right)\,\mathbf{\hat{y}} + a\left(y_5 + \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{81}}$	=	$-y_5\,\mathbf{a}_1 - z_5\,\mathbf{a}_2 - x_5\,\mathbf{a}_3$	=	$-ay_5\,\mathbf{\hat{x}} - az_5\,\mathbf{\hat{y}} - ax_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{82}}$	=	$y_5\,\mathbf{a}_1 - \left(z_5 - \frac{1}{2}\right)\,\mathbf{a}_2 + \left(x_5 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$ay_5\,\mathbf{\hat{x}} - a\left(z_5 - \frac{1}{2}\right)\,\mathbf{\hat{y}} + a\left(x_5 + \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{83}}$	=	$-\left(y_5 - \frac{1}{2}\right)\,\mathbf{a}_1 + \left(z_5 + \frac{1}{2}\right)\,\mathbf{a}_2 + x_5\,\mathbf{a}_3$	=	$-a\left(y_5 - \frac{1}{2}\right)\,\mathbf{\hat{x}} + a\left(z_5 + \frac{1}{2}\right)\,\mathbf{\hat{y}} + ax_5\,\mathbf{\hat{z}}$	(24d)	O II
$\mathbf{B_{84}}$	=	$\left(y_5 + \frac{1}{2}\right)\,\mathbf{a}_1 + z_5\,\mathbf{a}_2 - \left(x_5 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(y_5 + \frac{1}{2}\right)\,\mathbf{\hat{x}} + az_5\,\mathbf{\hat{y}} - a\left(x_5 - \frac{1}{2}\right)\,\mathbf{\hat{z}}$	(24d)	O II

References

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