Pt_3Zn_{10} Structure: A2B5_cF392_216_4efg_4ef4h-001

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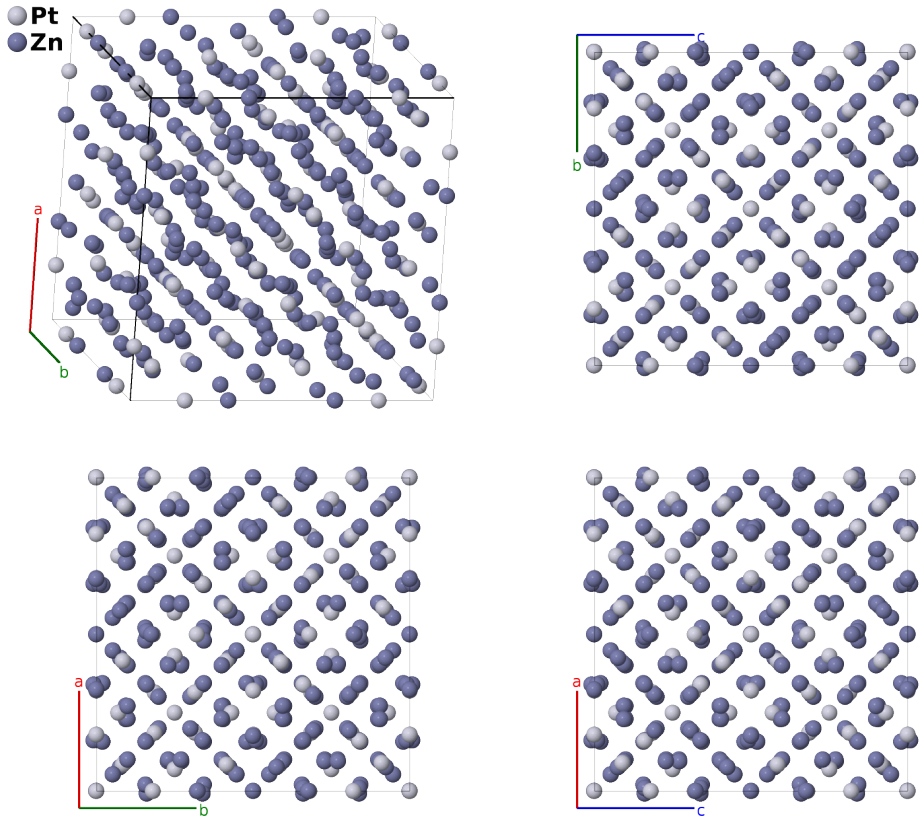
https://aflow.org/p/V17U

https://aflow.org/p/A2B5_cF392_216_4efg_4ef4h-001



Prototype	Pt_3Zn_{10}
AFLOW prototype label	A2B5_cF392_216_4efg_4ef4h-001
ICSD	105854
Pearson symbol	cF392
Space group number	216
Space group symbol	$F\bar{4}3m$
AFLOW prototype command	`aflow --proto=A2B5_cF392_216_4efg_4ef4h-001 --params=`$a, x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, x_{12}, z_{12}, x_{13}, z_{13}, x_{14}, z_{14}, x_{15}, z_{15}$

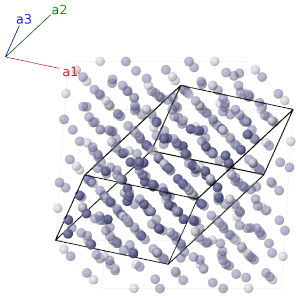
- The site occupation in this structure is rather complicated:
  - In any unit cell, only one of the Pt-II/Zn-II sites is occupied.
  - The site we have labeled Pt-II is actually 50% platinum and 50% zinc.

- The sites we have labeled Zn-II and Zn-V are 8.333% platinum and 91.667% zinc.
- The Pt-V and Pt-VI sites are 2/3 platinum and 1/3 zinc.

- Accounting for all of this the nominal composition of the structure is approximately Pt_3Zn_{10}.
- This is an example of an F-cell γ-brass. (Mizutani, 2010)
- (Johansson, 1970) give the Wyckoff positions of the (24h) sites as xyy. The standard representation, used by AFLOW, is xxy, so we have swapped their x and y coordinates for these sites.

Face-centered Cubic primitive vectors

$$\begin{aligned}
\mathbf{a_1} &= \tfrac{1}{2}a\,\hat{\mathbf{y}} + \tfrac{1}{2}a\,\hat{\mathbf{z}} \\
\mathbf{a_2} &= \tfrac{1}{2}a\,\hat{\mathbf{x}} + \tfrac{1}{2}a\,\hat{\mathbf{z}} \\
\mathbf{a_3} &= \tfrac{1}{2}a\,\hat{\mathbf{x}} + \tfrac{1}{2}a\,\hat{\mathbf{y}}
\end{aligned}$$



Basis vectors

		Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B_1}$	=	$x_1\,\mathbf{a}_1 + x_1\,\mathbf{a}_2 + x_1\,\mathbf{a}_3$	=	$ax_1\,\hat{\mathbf{x}} + ax_1\,\hat{\mathbf{y}} + ax_1\,\hat{\mathbf{z}}$	(16e)	Pt I
$\mathbf{B_2}$	=	$x_1\,\mathbf{a}_1 + x_1\,\mathbf{a}_2 - 3x_1\,\mathbf{a}_3$	=	$-ax_1\,\hat{\mathbf{x}} - ax_1\,\hat{\mathbf{y}} + ax_1\,\hat{\mathbf{z}}$	(16e)	Pt I
$\mathbf{B_3}$	=	$x_1\,\mathbf{a}_1 - 3x_1\,\mathbf{a}_2 + x_1\,\mathbf{a}_3$	=	$-ax_1\,\hat{\mathbf{x}} + ax_1\,\hat{\mathbf{y}} - ax_1\,\hat{\mathbf{z}}$	(16e)	Pt I
$\mathbf{B_4}$	=	$-3x_1\,\mathbf{a}_1 + x_1\,\mathbf{a}_2 + x_1\,\mathbf{a}_3$	=	$ax_1\,\hat{\mathbf{x}} - ax_1\,\hat{\mathbf{y}} - ax_1\,\hat{\mathbf{z}}$	(16e)	Pt I
$\mathbf{B_5}$	=	$x_2\,\mathbf{a}_1 + x_2\,\mathbf{a}_2 + x_2\,\mathbf{a}_3$	=	$ax_2\,\hat{\mathbf{x}} + ax_2\,\hat{\mathbf{y}} + ax_2\,\hat{\mathbf{z}}$	(16e)	Pt II
$\mathbf{B_6}$	=	$x_2\,\mathbf{a}_1 + x_2\,\mathbf{a}_2 - 3x_2\,\mathbf{a}_3$	=	$-ax_2\,\hat{\mathbf{x}} - ax_2\,\hat{\mathbf{y}} + ax_2\,\hat{\mathbf{z}}$	(16e)	Pt II
$\mathbf{B_7}$	=	$x_2\,\mathbf{a}_1 - 3x_2\,\mathbf{a}_2 + x_2\,\mathbf{a}_3$	=	$-ax_2\,\hat{\mathbf{x}} + ax_2\,\hat{\mathbf{y}} - ax_2\,\hat{\mathbf{z}}$	(16e)	Pt II
$\mathbf{B_8}$	=	$-3x_2\,\mathbf{a}_1 + x_2\,\mathbf{a}_2 + x_2\,\mathbf{a}_3$	=	$ax_2\,\hat{\mathbf{x}} - ax_2\,\hat{\mathbf{y}} - ax_2\,\hat{\mathbf{z}}$	(16e)	Pt II
$\mathbf{B_9}$	=	$x_3\,\mathbf{a}_1 + x_3\,\mathbf{a}_2 + x_3\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}} + ax_3\,\hat{\mathbf{y}} + ax_3\,\hat{\mathbf{z}}$	(16e)	Pt III
$\mathbf{B_{10}}$	=	$x_3\,\mathbf{a}_1 + x_3\,\mathbf{a}_2 - 3x_3\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}} - ax_3\,\hat{\mathbf{y}} + ax_3\,\hat{\mathbf{z}}$	(16e)	Pt III
$\mathbf{B_{11}}$	=	$x_3\,\mathbf{a}_1 - 3x_3\,\mathbf{a}_2 + x_3\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}} + ax_3\,\hat{\mathbf{y}} - ax_3\,\hat{\mathbf{z}}$	(16e)	Pt III
$\mathbf{B_{12}}$	=	$-3x_3\,\mathbf{a}_1 + x_3\,\mathbf{a}_2 + x_3\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}} - ax_3\,\hat{\mathbf{y}} - ax_3\,\hat{\mathbf{z}}$	(16e)	Pt III
$\mathbf{B_{13}}$	=	$x_4\,\mathbf{a}_1 + x_4\,\mathbf{a}_2 + x_4\,\mathbf{a}_3$	=	$ax_4\,\hat{\mathbf{x}} + ax_4\,\hat{\mathbf{y}} + ax_4\,\hat{\mathbf{z}}$	(16e)	Pt IV
$\mathbf{B_{14}}$	=	$x_4\,\mathbf{a}_1 + x_4\,\mathbf{a}_2 - 3x_4\,\mathbf{a}_3$	=	$-ax_4\,\hat{\mathbf{x}} - ax_4\,\hat{\mathbf{y}} + ax_4\,\hat{\mathbf{z}}$	(16e)	Pt IV
$\mathbf{B_{15}}$	=	$x_4\,\mathbf{a}_1 - 3x_4\,\mathbf{a}_2 + x_4\,\mathbf{a}_3$	=	$-ax_4\,\hat{\mathbf{x}} + ax_4\,\hat{\mathbf{y}} - ax_4\,\hat{\mathbf{z}}$	(16e)	Pt IV
$\mathbf{B_{16}}$	=	$-3x_4\,\mathbf{a}_1 + x_4\,\mathbf{a}_2 + x_4\,\mathbf{a}_3$	=	$ax_4\,\hat{\mathbf{x}} - ax_4\,\hat{\mathbf{y}} - ax_4\,\hat{\mathbf{z}}$	(16e)	Pt IV
$\mathbf{B_{17}}$	=	$x_5\,\mathbf{a}_1 + x_5\,\mathbf{a}_2 + x_5\,\mathbf{a}_3$	=	$ax_5\,\hat{\mathbf{x}} + ax_5\,\hat{\mathbf{y}} + ax_5\,\hat{\mathbf{z}}$	(16e)	Zn I
$\mathbf{B_{18}}$	=	$x_5\,\mathbf{a}_1 + x_5\,\mathbf{a}_2 - 3x_5\,\mathbf{a}_3$	=	$-ax_5\,\hat{\mathbf{x}} - ax_5\,\hat{\mathbf{y}} + ax_5\,\hat{\mathbf{z}}$	(16e)	Zn I
$\mathbf{B_{19}}$	=	$x_5\,\mathbf{a}_1 - 3x_5\,\mathbf{a}_2 + x_5\,\mathbf{a}_3$	=	$-ax_5\,\hat{\mathbf{x}} + ax_5\,\hat{\mathbf{y}} - ax_5\,\hat{\mathbf{z}}$	(16e)	Zn I
$\mathbf{B_{20}}$	=	$-3x_5\,\mathbf{a}_1 + x_5\,\mathbf{a}_2 + x_5\,\mathbf{a}_3$	=	$ax_5\,\hat{\mathbf{x}} - ax_5\,\hat{\mathbf{y}} - ax_5\,\hat{\mathbf{z}}$	(16e)	Zn I
$\mathbf{B_{21}}$	=	$x_6\,\mathbf{a}_1 + x_6\,\mathbf{a}_2 + x_6\,\mathbf{a}_3$	=	$ax_6\,\hat{\mathbf{x}} + ax_6\,\hat{\mathbf{y}} + ax_6\,\hat{\mathbf{z}}$	(16e)	Zn II
$\mathbf{B_{22}}$	=	$x_6\,\mathbf{a}_1 + x_6\,\mathbf{a}_2 - 3x_6\,\mathbf{a}_3$	=	$-ax_6\,\hat{\mathbf{x}} - ax_6\,\hat{\mathbf{y}} + ax_6\,\hat{\mathbf{z}}$	(16e)	Zn II

$\mathbf{B_{23}}$	=	$x_6\,\mathbf{a}_1 - 3x_6\,\mathbf{a}_2 + x_6\,\mathbf{a}_3$	=	$-ax_6\,\hat{\mathbf{x}} + ax_6\,\hat{\mathbf{y}} - ax_6\,\hat{\mathbf{z}}$	(16e)	Zn II
$\mathbf{B_{24}}$	=	$-3x_6\,\mathbf{a}_1 + x_6\,\mathbf{a}_2 + x_6\,\mathbf{a}_3$	=	$ax_6\,\hat{\mathbf{x}} - ax_6\,\hat{\mathbf{y}} - ax_6\,\hat{\mathbf{z}}$	(16e)	Zn II
$\mathbf{B_{25}}$	=	$x_7\,\mathbf{a}_1 + x_7\,\mathbf{a}_2 + x_7\,\mathbf{a}_3$	=	$ax_7\,\hat{\mathbf{x}} + ax_7\,\hat{\mathbf{y}} + ax_7\,\hat{\mathbf{z}}$	(16e)	Zn III
$\mathbf{B_{26}}$	=	$x_7\,\mathbf{a}_1 + x_7\,\mathbf{a}_2 - 3x_7\,\mathbf{a}_3$	=	$-ax_7\,\hat{\mathbf{x}} - ax_7\,\hat{\mathbf{y}} + ax_7\,\hat{\mathbf{z}}$	(16e)	Zn III
$\mathbf{B_{27}}$	=	$x_7\,\mathbf{a}_1 - 3x_7\,\mathbf{a}_2 + x_7\,\mathbf{a}_3$	=	$-ax_7\,\hat{\mathbf{x}} + ax_7\,\hat{\mathbf{y}} - ax_7\,\hat{\mathbf{z}}$	(16e)	Zn III
$\mathbf{B_{28}}$	=	$-3x_7\,\mathbf{a}_1 + x_7\,\mathbf{a}_2 + x_7\,\mathbf{a}_3$	=	$ax_7\,\hat{\mathbf{x}} - ax_7\,\hat{\mathbf{y}} - ax_7\,\hat{\mathbf{z}}$	(16e)	Zn III
$\mathbf{B_{29}}$	=	$x_8\,\mathbf{a}_1 + x_8\,\mathbf{a}_2 + x_8\,\mathbf{a}_3$	=	$ax_8\,\hat{\mathbf{x}} + ax_8\,\hat{\mathbf{y}} + ax_8\,\hat{\mathbf{z}}$	(16e)	Zn IV
$\mathbf{B_{30}}$	=	$x_8\,\mathbf{a}_1 + x_8\,\mathbf{a}_2 - 3x_8\,\mathbf{a}_3$	=	$-ax_8\,\hat{\mathbf{x}} - ax_8\,\hat{\mathbf{y}} + ax_8\,\hat{\mathbf{z}}$	(16e)	Zn IV
$\mathbf{B_{31}}$	=	$x_8\,\mathbf{a}_1 - 3x_8\,\mathbf{a}_2 + x_8\,\mathbf{a}_3$	=	$-ax_8\,\hat{\mathbf{x}} + ax_8\,\hat{\mathbf{y}} - ax_8\,\hat{\mathbf{z}}$	(16e)	Zn IV
$\mathbf{B_{32}}$	=	$-3x_8\,\mathbf{a}_1 + x_8\,\mathbf{a}_2 + x_8\,\mathbf{a}_3$	=	$ax_8\,\hat{\mathbf{x}} - ax_8\,\hat{\mathbf{y}} - ax_8\,\hat{\mathbf{z}}$	(16e)	Zn IV
$\mathbf{B_{33}}$	=	$-x_9\,\mathbf{a}_1 + x_9\,\mathbf{a}_2 + x_9\,\mathbf{a}_3$	=	$ax_9\,\hat{\mathbf{x}}$	(24f)	Pt V
$\mathbf{B_{34}}$	=	$x_9\,\mathbf{a}_1 - x_9\,\mathbf{a}_2 - x_9\,\mathbf{a}_3$	=	$-ax_9\,\hat{\mathbf{x}}$	(24f)	Pt V
$\mathbf{B_{35}}$	=	$x_9\,\mathbf{a}_1 - x_9\,\mathbf{a}_2 + x_9\,\mathbf{a}_3$	=	$ax_9\,\hat{\mathbf{y}}$	(24f)	Pt V
$\mathbf{B_{36}}$	=	$-x_9\,\mathbf{a}_1 + x_9\,\mathbf{a}_2 - x_9\,\mathbf{a}_3$	=	$-ax_9\,\hat{\mathbf{y}}$	(24f)	Pt V
$\mathbf{B_{37}}$	=	$x_9\,\mathbf{a}_1 + x_9\,\mathbf{a}_2 - x_9\,\mathbf{a}_3$	=	$ax_9\,\hat{\mathbf{z}}$	(24f)	Pt V
$\mathbf{B_{38}}$	=	$-x_9\,\mathbf{a}_1 - x_9\,\mathbf{a}_2 + x_9\,\mathbf{a}_3$	=	$-ax_9\,\hat{\mathbf{z}}$	(24f)	Pt V
$\mathbf{B_{39}}$	=	$-x_{10}\,\mathbf{a}_1 + x_{10}\,\mathbf{a}_2 + x_{10}\,\mathbf{a}_3$	=	$ax_{10}\,\hat{\mathbf{x}}$	(24f)	Zn V
$\mathbf{B_{40}}$	=	$x_{10}\,\mathbf{a}_1 - x_{10}\,\mathbf{a}_2 - x_{10}\,\mathbf{a}_3$	=	$-ax_{10}\,\hat{\mathbf{x}}$	(24f)	Zn V
$\mathbf{B_{41}}$	=	$x_{10}\,\mathbf{a}_1 - x_{10}\,\mathbf{a}_2 + x_{10}\,\mathbf{a}_3$	=	$ax_{10}\,\hat{\mathbf{y}}$	(24f)	Zn V
$\mathbf{B_{42}}$	=	$-x_{10}\,\mathbf{a}_1 + x_{10}\,\mathbf{a}_2 - x_{10}\,\mathbf{a}_3$	=	$-ax_{10}\,\hat{\mathbf{y}}$	(24f)	Zn V
$\mathbf{B_{43}}$	=	$x_{10}\,\mathbf{a}_1 + x_{10}\,\mathbf{a}_2 - x_{10}\,\mathbf{a}_3$	=	$ax_{10}\,\hat{\mathbf{z}}$	(24f)	Zn V
$\mathbf{B_{44}}$	=	$-x_{10}\,\mathbf{a}_1 - x_{10}\,\mathbf{a}_2 + x_{10}\,\mathbf{a}_3$	=	$-ax_{10}\,\hat{\mathbf{z}}$	(24f)	Zn V
$\mathbf{B_{45}}$	=	$-\left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_1 + x_{11}\,\mathbf{a}_2 + x_{11}\,\mathbf{a}_3$	=	$ax_{11}\,\hat{\mathbf{x}} + \frac{1}{4}a\,\hat{\mathbf{y}} + \frac{1}{4}a\,\hat{\mathbf{z}}$	(24g)	Pt VI
$\mathbf{B_{46}}$	=	$x_{11}\,\mathbf{a}_1 - \left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_2 - \left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_{11} - \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{1}{4}a\,\hat{\mathbf{y}} + \frac{1}{4}a\,\hat{\mathbf{z}}$	(24g)	Pt VI
$\mathbf{B_{47}}$	=	$x_{11}\,\mathbf{a}_1 - \left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_2 + x_{11}\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{x}} + ax_{11}\,\hat{\mathbf{y}} + \frac{1}{4}a\,\hat{\mathbf{z}}$	(24g)	Pt VI
$\mathbf{B_{48}}$	=	$-\left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_1 + x_{11}\,\mathbf{a}_2 - \left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{x}} - a\left(x_{11} - \frac{1}{2}\right)\,\hat{\mathbf{y}} + \frac{1}{4}a\,\hat{\mathbf{z}}$	(24g)	Pt VI
$\mathbf{B_{49}}$	=	$x_{11}\,\mathbf{a}_1 + x_{11}\,\mathbf{a}_2 - \left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{x}} + \frac{1}{4}a\,\hat{\mathbf{y}} + ax_{11}\,\hat{\mathbf{z}}$	(24g)	Pt VI
$\mathbf{B_{50}}$	=	$-\left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_1 - \left(x_{11} - \frac{1}{2}\right)\,\mathbf{a}_2 + x_{11}\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{x}} + \frac{1}{4}a\,\hat{\mathbf{y}} - a\left(x_{11} - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(24g)	Pt VI
$\mathbf{B_{51}}$	=	$z_{12}\,\mathbf{a}_1 + z_{12}\,\mathbf{a}_2 + (2x_{12} - z_{12})\,\mathbf{a}_3$	=	$ax_{12}\,\hat{\mathbf{x}} + ax_{12}\,\hat{\mathbf{y}} + az_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{52}}$	=	$z_{12}\,\mathbf{a}_1 + z_{12}\,\mathbf{a}_2 - (2x_{12} + z_{12})\,\mathbf{a}_3$	=	$-ax_{12}\,\hat{\mathbf{x}} - ax_{12}\,\hat{\mathbf{y}} + az_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{53}}$	=	$(2x_{12} - z_{12})\,\mathbf{a}_1 - (2x_{12} + z_{12})\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3$	=	$-ax_{12}\,\hat{\mathbf{x}} + ax_{12}\,\hat{\mathbf{y}} - az_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{54}}$	=	$-(2x_{12} + z_{12})\,\mathbf{a}_1 + (2x_{12} - z_{12})\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3$	=	$ax_{12}\,\hat{\mathbf{x}} - ax_{12}\,\hat{\mathbf{y}} - az_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{55}}$	=	$(2x_{12} - z_{12})\,\mathbf{a}_1 + z_{12}\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3$	=	$az_{12}\,\hat{\mathbf{x}} + ax_{12}\,\hat{\mathbf{y}} + ax_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{56}}$	=	$-(2x_{12} + z_{12})\,\mathbf{a}_1 + z_{12}\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3$	=	$az_{12}\,\hat{\mathbf{x}} - ax_{12}\,\hat{\mathbf{y}} - ax_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{57}}$	=	$z_{12}\,\mathbf{a}_1 + (2x_{12} - z_{12})\,\mathbf{a}_2 - (2x_{12} + z_{12})\,\mathbf{a}_3$	=	$-az_{12}\,\hat{\mathbf{x}} - ax_{12}\,\hat{\mathbf{y}} + ax_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{58}}$	=	$z_{12}\,\mathbf{a}_1 - (2x_{12} + z_{12})\,\mathbf{a}_2 + (2x_{12} - z_{12})\,\mathbf{a}_3$	=	$-az_{12}\,\hat{\mathbf{x}} + ax_{12}\,\hat{\mathbf{y}} - ax_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI

$\mathbf{B_{59}}$	=	$z_{12}\,\mathbf{a}_1 + (2x_{12} - z_{12})\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3$	=	$ax_{12}\,\hat{\mathbf{x}} + az_{12}\,\hat{\mathbf{y}} + ax_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{60}}$	=	$z_{12}\,\mathbf{a}_1 - (2x_{12} + z_{12})\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3$	=	$-ax_{12}\,\hat{\mathbf{x}} + az_{12}\,\hat{\mathbf{y}} - ax_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{61}}$	=	$-(2x_{12} + z_{12})\,\mathbf{a}_1 + z_{12}\,\mathbf{a}_2 + (2x_{12} - z_{12})\,\mathbf{a}_3$	=	$ax_{12}\,\hat{\mathbf{x}} - az_{12}\,\hat{\mathbf{y}} - ax_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{62}}$	=	$(2x_{12} - z_{12})\,\mathbf{a}_1 + z_{12}\,\mathbf{a}_2 - (2x_{12} + z_{12})\,\mathbf{a}_3$	=	$-ax_{12}\,\hat{\mathbf{x}} - az_{12}\,\hat{\mathbf{y}} + ax_{12}\,\hat{\mathbf{z}}$	(48h)	Zn VI
$\mathbf{B_{63}}$	=	$z_{13}\,\mathbf{a}_1 + z_{13}\,\mathbf{a}_2 + (2x_{13} - z_{13})\,\mathbf{a}_3$	=	$ax_{13}\,\hat{\mathbf{x}} + ax_{13}\,\hat{\mathbf{y}} + az_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{64}}$	=	$z_{13}\,\mathbf{a}_1 + z_{13}\,\mathbf{a}_2 - (2x_{13} + z_{13})\,\mathbf{a}_3$	=	$-ax_{13}\,\hat{\mathbf{x}} - ax_{13}\,\hat{\mathbf{y}} + az_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{65}}$	=	$(2x_{13} - z_{13})\,\mathbf{a}_1 - (2x_{13} + z_{13})\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3$	=	$-ax_{13}\,\hat{\mathbf{x}} + ax_{13}\,\hat{\mathbf{y}} - az_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{66}}$	=	$-(2x_{13} + z_{13})\,\mathbf{a}_1 + (2x_{13} - z_{13})\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3$	=	$ax_{13}\,\hat{\mathbf{x}} - ax_{13}\,\hat{\mathbf{y}} - az_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{67}}$	=	$(2x_{13} - z_{13})\,\mathbf{a}_1 + z_{13}\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3$	=	$az_{13}\,\hat{\mathbf{x}} + ax_{13}\,\hat{\mathbf{y}} + ax_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{68}}$	=	$-(2x_{13} + z_{13})\,\mathbf{a}_1 + z_{13}\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3$	=	$az_{13}\,\hat{\mathbf{x}} - ax_{13}\,\hat{\mathbf{y}} - ax_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{69}}$	=	$z_{13}\,\mathbf{a}_1 + (2x_{13} - z_{13})\,\mathbf{a}_2 - (2x_{13} + z_{13})\,\mathbf{a}_3$	=	$-az_{13}\,\hat{\mathbf{x}} - ax_{13}\,\hat{\mathbf{y}} + ax_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{70}}$	=	$z_{13}\,\mathbf{a}_1 - (2x_{13} + z_{13})\,\mathbf{a}_2 + (2x_{13} - z_{13})\,\mathbf{a}_3$	=	$-az_{13}\,\hat{\mathbf{x}} + ax_{13}\,\hat{\mathbf{y}} - ax_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{71}}$	=	$z_{13}\,\mathbf{a}_1 + (2x_{13} - z_{13})\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3$	=	$ax_{13}\,\hat{\mathbf{x}} + az_{13}\,\hat{\mathbf{y}} + ax_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{72}}$	=	$z_{13}\,\mathbf{a}_1 - (2x_{13} + z_{13})\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3$	=	$-ax_{13}\,\hat{\mathbf{x}} + az_{13}\,\hat{\mathbf{y}} - ax_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{73}}$	=	$-(2x_{13} + z_{13})\,\mathbf{a}_1 + z_{13}\,\mathbf{a}_2 + (2x_{13} - z_{13})\,\mathbf{a}_3$	=	$ax_{13}\,\hat{\mathbf{x}} - az_{13}\,\hat{\mathbf{y}} - ax_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{74}}$	=	$(2x_{13} - z_{13})\,\mathbf{a}_1 + z_{13}\,\mathbf{a}_2 - (2x_{13} + z_{13})\,\mathbf{a}_3$	=	$-ax_{13}\,\hat{\mathbf{x}} - az_{13}\,\hat{\mathbf{y}} + ax_{13}\,\hat{\mathbf{z}}$	(48h)	Zn VII
$\mathbf{B_{75}}$	=	$z_{14}\,\mathbf{a}_1 + z_{14}\,\mathbf{a}_2 + (2x_{14} - z_{14})\,\mathbf{a}_3$	=	$ax_{14}\,\hat{\mathbf{x}} + ax_{14}\,\hat{\mathbf{y}} + az_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{76}}$	=	$z_{14}\,\mathbf{a}_1 + z_{14}\,\mathbf{a}_2 - (2x_{14} + z_{14})\,\mathbf{a}_3$	=	$-ax_{14}\,\hat{\mathbf{x}} - ax_{14}\,\hat{\mathbf{y}} + az_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{77}}$	=	$(2x_{14} - z_{14})\,\mathbf{a}_1 - (2x_{14} + z_{14})\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3$	=	$-ax_{14}\,\hat{\mathbf{x}} + ax_{14}\,\hat{\mathbf{y}} - az_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{78}}$	=	$-(2x_{14} + z_{14})\,\mathbf{a}_1 + (2x_{14} - z_{14})\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3$	=	$ax_{14}\,\hat{\mathbf{x}} - ax_{14}\,\hat{\mathbf{y}} - az_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{79}}$	=	$(2x_{14} - z_{14})\,\mathbf{a}_1 + z_{14}\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3$	=	$az_{14}\,\hat{\mathbf{x}} + ax_{14}\,\hat{\mathbf{y}} + ax_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{80}}$	=	$-(2x_{14} + z_{14})\,\mathbf{a}_1 + z_{14}\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3$	=	$az_{14}\,\hat{\mathbf{x}} - ax_{14}\,\hat{\mathbf{y}} - ax_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{81}}$	=	$z_{14}\,\mathbf{a}_1 + (2x_{14} - z_{14})\,\mathbf{a}_2 - (2x_{14} + z_{14})\,\mathbf{a}_3$	=	$-az_{14}\,\hat{\mathbf{x}} - ax_{14}\,\hat{\mathbf{y}} + ax_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{82}}$	=	$z_{14}\,\mathbf{a}_1 - (2x_{14} + z_{14})\,\mathbf{a}_2 + (2x_{14} - z_{14})\,\mathbf{a}_3$	=	$-az_{14}\,\hat{\mathbf{x}} + ax_{14}\,\hat{\mathbf{y}} - ax_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{83}}$	=	$z_{14}\,\mathbf{a}_1 + (2x_{14} - z_{14})\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3$	=	$ax_{14}\,\hat{\mathbf{x}} + az_{14}\,\hat{\mathbf{y}} + ax_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{84}}$	=	$z_{14}\,\mathbf{a}_1 - (2x_{14} + z_{14})\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3$	=	$-ax_{14}\,\hat{\mathbf{x}} + az_{14}\,\hat{\mathbf{y}} - ax_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{85}}$	=	$-(2x_{14} + z_{14})\,\mathbf{a}_1 + z_{14}\,\mathbf{a}_2 + (2x_{14} - z_{14})\,\mathbf{a}_3$	=	$ax_{14}\,\hat{\mathbf{x}} - az_{14}\,\hat{\mathbf{y}} - ax_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{86}}$	=	$(2x_{14} - z_{14})\,\mathbf{a}_1 + z_{14}\,\mathbf{a}_2 - (2x_{14} + z_{14})\,\mathbf{a}_3$	=	$-ax_{14}\,\hat{\mathbf{x}} - az_{14}\,\hat{\mathbf{y}} + ax_{14}\,\hat{\mathbf{z}}$	(48h)	Zn VIII
$\mathbf{B_{87}}$	=	$z_{15}\,\mathbf{a}_1 + z_{15}\,\mathbf{a}_2 + (2x_{15} - z_{15})\,\mathbf{a}_3$	=	$ax_{15}\,\hat{\mathbf{x}} + ax_{15}\,\hat{\mathbf{y}} + az_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{88}}$	=	$z_{15}\,\mathbf{a}_1 + z_{15}\,\mathbf{a}_2 - (2x_{15} + z_{15})\,\mathbf{a}_3$	=	$-ax_{15}\,\hat{\mathbf{x}} - ax_{15}\,\hat{\mathbf{y}} + az_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX

$\mathbf{B_{89}}$	=	$(2x_{15} - z_{15})\ \mathbf{a}_1 - (2x_{15} + z_{15})\ \mathbf{a}_2 + z_{15}\,\mathbf{a}_3$	=	$-ax_{15}\,\hat{\mathbf{x}} + ax_{15}\,\hat{\mathbf{y}} - az_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{90}}$	=	$-(2x_{15} + z_{15})\ \mathbf{a}_1 + (2x_{15} - z_{15})\ \mathbf{a}_2 + z_{15}\,\mathbf{a}_3$	=	$ax_{15}\,\hat{\mathbf{x}} - ax_{15}\,\hat{\mathbf{y}} - az_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{91}}$	=	$(2x_{15} - z_{15})\ \mathbf{a}_1 + z_{15}\,\mathbf{a}_2 + z_{15}\,\mathbf{a}_3$	=	$az_{15}\,\hat{\mathbf{x}} + ax_{15}\,\hat{\mathbf{y}} + ax_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{92}}$	=	$-(2x_{15} + z_{15})\ \mathbf{a}_1 + z_{15}\,\mathbf{a}_2 + z_{15}\,\mathbf{a}_3$	=	$az_{15}\,\hat{\mathbf{x}} - ax_{15}\,\hat{\mathbf{y}} - ax_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{93}}$	=	$z_{15}\,\mathbf{a}_1 + (2x_{15} - z_{15})\ \mathbf{a}_2 - (2x_{15} + z_{15})\ \mathbf{a}_3$	=	$-az_{15}\,\hat{\mathbf{x}} - ax_{15}\,\hat{\mathbf{y}} + ax_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{94}}$	=	$z_{15}\,\mathbf{a}_1 - (2x_{15} + z_{15})\ \mathbf{a}_2 + (2x_{15} - z_{15})\ \mathbf{a}_3$	=	$-az_{15}\,\hat{\mathbf{x}} + ax_{15}\,\hat{\mathbf{y}} - ax_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{95}}$	=	$z_{15}\,\mathbf{a}_1 + (2x_{15} - z_{15})\ \mathbf{a}_2 + z_{15}\,\mathbf{a}_3$	=	$ax_{15}\,\hat{\mathbf{x}} + az_{15}\,\hat{\mathbf{y}} + ax_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{96}}$	=	$z_{15}\,\mathbf{a}_1 - (2x_{15} + z_{15})\ \mathbf{a}_2 + z_{15}\,\mathbf{a}_3$	=	$-ax_{15}\,\hat{\mathbf{x}} + az_{15}\,\hat{\mathbf{y}} - ax_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{97}}$	=	$-(2x_{15} + z_{15})\ \mathbf{a}_1 + z_{15}\,\mathbf{a}_2 + (2x_{15} - z_{15})\ \mathbf{a}_3$	=	$ax_{15}\,\hat{\mathbf{x}} - az_{15}\,\hat{\mathbf{y}} - ax_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX
$\mathbf{B_{98}}$	=	$(2x_{15} - z_{15})\ \mathbf{a}_1 + z_{15}\,\mathbf{a}_2 - (2x_{15} + z_{15})\ \mathbf{a}_3$	=	$-ax_{15}\,\hat{\mathbf{x}} - az_{15}\,\hat{\mathbf{y}} + ax_{15}\,\hat{\mathbf{z}}$	(48h)	Zn IX

References

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