$Ni_{13}Ga_3Ge_6$ Structure: A3B6C13_hP66_152_ac_3c_a2b5c-001

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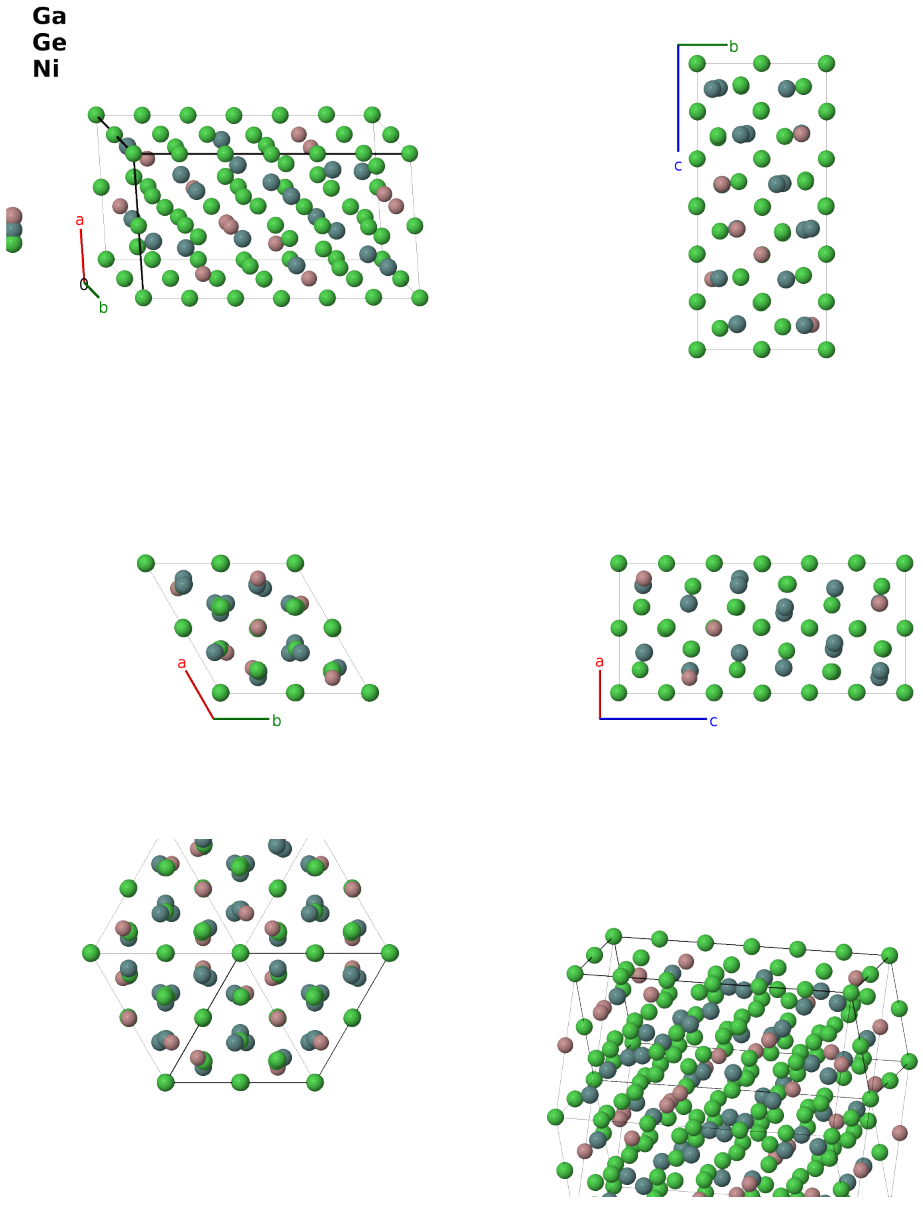
https://aflow.org/prototype-encyclopedia/A5TG

https://aflow.org/prototype-encyclopedia/A3B6C13_hP66_152_ac_3c_a2b5c-001



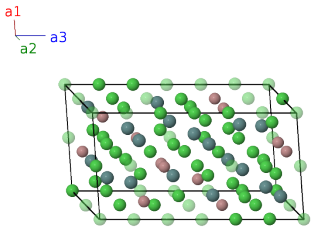
Prototype	$Ga_3Ge_6Ni_{13}$
AFLOW prototype label	A3B6C13_hP66_152_ac_3c_a2b5c-001
ICSD	52177

CCDC	1616972
Pearson symbol	hP66
Space group number	152
Space group symbol	$P3_121$
AFLOW prototype command	`aflow --proto=A3B6C13_hP66_152_ac_3c_a2b5c-001 --params=`$a, c/a, x_1, x_2, x_3, x_4, x_5, y_5, z_5, x_6, y_6, z_6, x_7, y_7, z_7, x_8, y_8, z_8, x_9, y_9, z_9, x_{10}, y_{10}, z_{10}, x_{11}, y_{11}, z_{11}, x_{12}, y_{12}, z_{12}, x_{13}, y_{13}, z_{13}$

- This structure can also exist in the enantiomorphic space group $P3_221$ #154.

Trigonal (Hexagonal) primitive vectors

$$\mathbf{a_1} = \frac{1}{2}a\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,\hat{\mathbf{y}}$$
$$\mathbf{a_2} = \frac{1}{2}a\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,\hat{\mathbf{y}}$$
$$\mathbf{a_3} = c\,\hat{\mathbf{z}}$$



Basis vectors

		Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B_1}$	=	$x_1\,\mathbf{a}_1 + \frac{1}{3}\,\mathbf{a}_3$	=	$\frac{1}{2}ax_1\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_1\,\hat{\mathbf{y}} + \frac{1}{3}c\,\hat{\mathbf{z}}$	(3a)	Ga I
$\mathbf{B_2}$	=	$x_1\,\mathbf{a}_2 + \frac{2}{3}\,\mathbf{a}_3$	=	$\frac{1}{2}ax_1\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_1\,\hat{\mathbf{y}} + \frac{2}{3}c\,\hat{\mathbf{z}}$	(3a)	Ga I
$\mathbf{B_3}$	=	$-x_1\,\mathbf{a}_1 - x_1\,\mathbf{a}_2$	=	$-ax_1\,\hat{\mathbf{x}}$	(3a)	Ga I
$\mathbf{B_4}$	=	$x_2\,\mathbf{a}_1 + \frac{1}{3}\,\mathbf{a}_3$	=	$\frac{1}{2}ax_2\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_2\,\hat{\mathbf{y}} + \frac{1}{3}c\,\hat{\mathbf{z}}$	(3a)	Ni I
$\mathbf{B_5}$	=	$x_2\,\mathbf{a}_2 + \frac{2}{3}\,\mathbf{a}_3$	=	$\frac{1}{2}ax_2\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_2\,\hat{\mathbf{y}} + \frac{2}{3}c\,\hat{\mathbf{z}}$	(3a)	Ni I
$\mathbf{B_6}$	=	$-x_2\,\mathbf{a}_1 - x_2\,\mathbf{a}_2$	=	$-ax_2\,\hat{\mathbf{x}}$	(3a)	Ni I
$\mathbf{B_7}$	=	$x_3\,\mathbf{a}_1 + \frac{5}{6}\,\mathbf{a}_3$	=	$\frac{1}{2}ax_3\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_3\,\hat{\mathbf{y}} + \frac{5}{6}c\,\hat{\mathbf{z}}$	(3b)	Ni II
$\mathbf{B_8}$	=	$x_3\,\mathbf{a}_2 + \frac{1}{6}\,\mathbf{a}_3$	=	$\frac{1}{2}ax_3\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_3\,\hat{\mathbf{y}} + \frac{1}{6}c\,\hat{\mathbf{z}}$	(3b)	Ni II
$\mathbf{B_9}$	=	$-x_3\,\mathbf{a}_1 - x_3\,\mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}} + \frac{1}{2}c\,\hat{\mathbf{z}}$	(3b)	Ni II
$\mathbf{B_{10}}$	=	$x_4\,\mathbf{a}_1 + \frac{5}{6}\,\mathbf{a}_3$	=	$\frac{1}{2}ax_4\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_4\,\hat{\mathbf{y}} + \frac{5}{6}c\,\hat{\mathbf{z}}$	(3b)	Ni III
$\mathbf{B_{11}}$	=	$x_4\,\mathbf{a}_2 + \frac{1}{6}\,\mathbf{a}_3$	=	$\frac{1}{2}ax_4\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_4\,\hat{\mathbf{y}} + \frac{1}{6}c\,\hat{\mathbf{z}}$	(3b)	Ni III
$\mathbf{B_{12}}$	=	$-x_4\,\mathbf{a}_1 - x_4\,\mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$-ax_4\,\hat{\mathbf{x}} + \frac{1}{2}c\,\hat{\mathbf{z}}$	(3b)	Ni III
$\mathbf{B_{13}}$	=	$x_5\,\mathbf{a}_1 + y_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 + y_5)\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$	(6c)	Ga II
$\mathbf{B_{14}}$	=	$-y_5\,\mathbf{a}_1 + (x_5 - y_5)\,\mathbf{a}_2 + \left(z_5 + \frac{1}{3}\right)\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 - 2y_5)\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} + c\left(z_5 + \frac{1}{3}\right)\,\hat{\mathbf{z}}$	(6c)	Ga II
$\mathbf{B_{15}}$	=	$-(x_5 - y_5)\,\mathbf{a}_1 - x_5\,\mathbf{a}_2 + \left(z_5 + \frac{2}{3}\right)\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_5 - y_5)\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} + \frac{1}{3}c\,(3z_5 + 2)\,\hat{\mathbf{z}}$	(6c)	Ga II
$\mathbf{B_{16}}$	=	$y_5\,\mathbf{a}_1 + x_5\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 + y_5)\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\,\hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$	(6c)	Ga II
$\mathbf{B_{17}}$	=	$(x_5 - y_5)\,\mathbf{a}_1 - y_5\,\mathbf{a}_2 - \left(z_5 - \frac{2}{3}\right)\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 - 2y_5)\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} - \frac{1}{3}c\,(3z_5 - 2)\,\hat{\mathbf{z}}$	(6c)	Ga II

$$\mathbf{B_{18}} = -x_5\,\mathbf{a}_1-(x_5-y_5)\,\mathbf{a}_2-\left(z_5-\tfrac{1}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_5-y_5)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}}-c\left(z_5-\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ga II}$$

$$\mathbf{B_{19}} = x_6\,\mathbf{a}_1+y_6\,\mathbf{a}_2+z_6\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6+y_6)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}a\,(x_6-y_6)\,\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge I}$$

$$\mathbf{B_{20}} = -y_6\,\mathbf{a}_1+(x_6-y_6)\,\mathbf{a}_2+\left(z_6+\tfrac{1}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6-2y_6)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}}+c\left(z_6+\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge I}$$

$$\mathbf{B_{21}} = -(x_6-y_6)\,\mathbf{a}_1-x_6\,\mathbf{a}_2+\left(z_6+\tfrac{2}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_6-y_6)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}}+\tfrac{1}{3}c\,(3z_6+2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge I}$$

$$\mathbf{B_{22}} = y_6\,\mathbf{a}_1+x_6\,\mathbf{a}_2-z_6\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6+y_6)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}a\,(x_6-y_6)\,\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge I}$$

$$\mathbf{B_{23}} = (x_6-y_6)\,\mathbf{a}_1-y_6\,\mathbf{a}_2-\left(z_6-\tfrac{2}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6-2y_6)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}}-\tfrac{1}{3}c\,(3z_6-2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge I}$$

$$\mathbf{B_{24}} = -x_6\,\mathbf{a}_1-(x_6-y_6)\,\mathbf{a}_2-\left(z_6-\tfrac{1}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_6-y_6)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}}-c\left(z_6-\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge I}$$

$$\mathbf{B_{25}} = x_7\,\mathbf{a}_1+y_7\,\mathbf{a}_2+z_7\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_7+y_7)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}a\,(x_7-y_7)\,\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge II}$$

$$\mathbf{B_{26}} = -y_7\,\mathbf{a}_1+(x_7-y_7)\,\mathbf{a}_2+\left(z_7+\tfrac{1}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_7-2y_7)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}}+c\left(z_7+\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge II}$$

$$\mathbf{B_{27}} = -(x_7-y_7)\,\mathbf{a}_1-x_7\,\mathbf{a}_2+\left(z_7+\tfrac{2}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_7-y_7)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}}+\tfrac{1}{3}c\,(3z_7+2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge II}$$

$$\mathbf{B_{28}} = y_7\,\mathbf{a}_1+x_7\,\mathbf{a}_2-z_7\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_7+y_7)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}a\,(x_7-y_7)\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge II}$$

$$\mathbf{B_{29}} = (x_7-y_7)\,\mathbf{a}_1-y_7\,\mathbf{a}_2-\left(z_7-\tfrac{2}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_7-2y_7)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}}-\tfrac{1}{3}c\,(3z_7-2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge II}$$

$$\mathbf{B_{30}} = -x_7\,\mathbf{a}_1-(x_7-y_7)\,\mathbf{a}_2-\left(z_7-\tfrac{1}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_7-y_7)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}}-c\left(z_7-\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge II}$$

$$\mathbf{B_{31}} = x_8\,\mathbf{a}_1+y_8\,\mathbf{a}_2+z_8\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_8+y_8)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}a\,(x_8-y_8)\,\hat{\mathbf{y}}+cz_8\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge III}$$

$$\mathbf{B_{32}} = -y_8\,\mathbf{a}_1+(x_8-y_8)\,\mathbf{a}_2+\left(z_8+\tfrac{1}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_8-2y_8)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ax_8\,\hat{\mathbf{y}}+c\left(z_8+\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge III}$$

$$\mathbf{B_{33}} = -(x_8-y_8)\,\mathbf{a}_1-x_8\,\mathbf{a}_2+\left(z_8+\tfrac{2}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_8-y_8)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ay_8\,\hat{\mathbf{y}}+\tfrac{1}{3}c\,(3z_8+2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge III}$$

$$\mathbf{B_{34}} = y_8\,\mathbf{a}_1+x_8\,\mathbf{a}_2-z_8\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_8+y_8)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}a\,(x_8-y_8)\,\hat{\mathbf{y}}-cz_8\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge III}$$

$$\mathbf{B_{35}} = (x_8-y_8)\,\mathbf{a}_1-y_8\,\mathbf{a}_2-\left(z_8-\tfrac{2}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_8-2y_8)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ax_8\,\hat{\mathbf{y}}-\tfrac{1}{3}c\,(3z_8-2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge III}$$

$$\mathbf{B_{36}} = -x_8\,\mathbf{a}_1-(x_8-y_8)\,\mathbf{a}_2-\left(z_8-\tfrac{1}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_8-y_8)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ay_8\,\hat{\mathbf{y}}-c\left(z_8-\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ge III}$$

$$\mathbf{B_{37}} = x_9\,\mathbf{a}_1+y_9\,\mathbf{a}_2+z_9\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_9+y_9)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}a\,(x_9-y_9)\,\hat{\mathbf{y}}+cz_9\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni IV}$$

$$\mathbf{B_{38}} = -y_9\,\mathbf{a}_1+(x_9-y_9)\,\mathbf{a}_2+\left(z_9+\tfrac{1}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_9-2y_9)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ax_9\,\hat{\mathbf{y}}+c\left(z_9+\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni IV}$$

$$\mathbf{B_{39}} = -(x_9-y_9)\,\mathbf{a}_1-x_9\,\mathbf{a}_2+\left(z_9+\tfrac{2}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_9-y_9)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ay_9\,\hat{\mathbf{y}}+\tfrac{1}{3}c\,(3z_9+2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni IV}$$

$$\mathbf{B_{40}} = y_9\,\mathbf{a}_1+x_9\,\mathbf{a}_2-z_9\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_9+y_9)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}a\,(x_9-y_9)\,\hat{\mathbf{y}}-cz_9\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni IV}$$

$$\mathbf{B_{41}} = (x_9-y_9)\,\mathbf{a}_1-y_9\,\mathbf{a}_2-\left(z_9-\tfrac{2}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_9-2y_9)\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ax_9\,\hat{\mathbf{y}}-\tfrac{1}{3}c\,(3z_9-2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni IV}$$

$$\mathbf{B_{42}} = -x_9\,\mathbf{a}_1-(x_9-y_9)\,\mathbf{a}_2-\left(z_9-\tfrac{1}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_9-y_9)\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ay_9\,\hat{\mathbf{y}}-c\left(z_9-\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni IV}$$

$$\mathbf{B_{43}} = x_{10}\,\mathbf{a}_1+y_{10}\,\mathbf{a}_2+z_{10}\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{10}+y_{10})\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}a\,(x_{10}-y_{10})\,\hat{\mathbf{y}}+cz_{10}\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni V}$$

$$\mathbf{B_{44}} = -y_{10}\,\mathbf{a}_1+(x_{10}-y_{10})\,\mathbf{a}_2+\left(z_{10}+\tfrac{1}{3}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{10}-2y_{10})\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}ax_{10}\,\hat{\mathbf{y}}+c\left(z_{10}+\tfrac{1}{3}\right)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni V}$$

$$\mathbf{B_{45}} = -(x_{10}-y_{10})\,\mathbf{a}_1-x_{10}\,\mathbf{a}_2+\left(z_{10}+\tfrac{2}{3}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_{10}-y_{10})\,\hat{\mathbf{x}}-\tfrac{\sqrt{3}}{2}ay_{10}\,\hat{\mathbf{y}}+\tfrac{1}{3}c\,(3z_{10}+2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni V}$$

$$\mathbf{B_{46}} = y_{10}\,\mathbf{a}_1+x_{10}\,\mathbf{a}_2-z_{10}\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{10}+y_{10})\,\hat{\mathbf{x}}+\tfrac{\sqrt{3}}{2}a\,(x_{10}-y_{10})\,\hat{\mathbf{y}}-cz_{10}\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni V}$$

$$\mathbf{B_{47}} = (x_{10}-y_{10})\,\mathbf{a}_1 - y_{10}\,\mathbf{a}_2 - \left(z_{10}-\tfrac{2}{3}\right)\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{10}-2y_{10})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_{10}\,\hat{\mathbf{y}} - \tfrac{1}{3}c\,(3z_{10}-2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni V}$$

$$\mathbf{B_{48}} = -x_{10}\,\mathbf{a}_1 - (x_{10}-y_{10})\,\mathbf{a}_2 - \left(z_{10}-\tfrac{1}{3}\right)\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_{10}-y_{10})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_{10}\,\hat{\mathbf{y}} - c\left(z_{10}-\tfrac{1}{3}\right)\hat{\mathbf{z}} \quad (6c) \quad \text{Ni V}$$

$$\mathbf{B_{49}} = x_{11}\,\mathbf{a}_1 + y_{11}\,\mathbf{a}_2 + z_{11}\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{11}+y_{11})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}a\,(x_{11}-y_{11})\,\hat{\mathbf{y}} + cz_{11}\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VI}$$

$$\mathbf{B_{50}} = -y_{11}\,\mathbf{a}_1 + (x_{11}-y_{11})\,\mathbf{a}_2 + \left(z_{11}+\tfrac{1}{3}\right)\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{11}-2y_{11})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ax_{11}\,\hat{\mathbf{y}} + c\left(z_{11}+\tfrac{1}{3}\right)\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VI}$$

$$\mathbf{B_{51}} = -(x_{11}-y_{11})\,\mathbf{a}_1 - x_{11}\,\mathbf{a}_2 + \left(z_{11}+\tfrac{2}{3}\right)\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_{11}-y_{11})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ay_{11}\,\hat{\mathbf{y}} + \tfrac{1}{3}c\,(3z_{11}+2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VI}$$

$$\mathbf{B_{52}} = y_{11}\,\mathbf{a}_1 + x_{11}\,\mathbf{a}_2 - z_{11}\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{11}+y_{11})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_{11}-y_{11})\,\hat{\mathbf{y}} - cz_{11}\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VI}$$

$$\mathbf{B_{53}} = (x_{11}-y_{11})\,\mathbf{a}_1 - y_{11}\,\mathbf{a}_2 - \left(z_{11}-\tfrac{2}{3}\right)\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{11}-2y_{11})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_{11}\,\hat{\mathbf{y}} - \tfrac{1}{3}c\,(3z_{11}-2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VI}$$

$$\mathbf{B_{54}} = -x_{11}\,\mathbf{a}_1 - (x_{11}-y_{11})\,\mathbf{a}_2 - \left(z_{11}-\tfrac{1}{3}\right)\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_{11}-y_{11})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_{11}\,\hat{\mathbf{y}} - c\left(z_{11}-\tfrac{1}{3}\right)\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VI}$$

$$\mathbf{B_{55}} = x_{12}\,\mathbf{a}_1 + y_{12}\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{12}+y_{12})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}a\,(x_{12}-y_{12})\,\hat{\mathbf{y}} + cz_{12}\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VII}$$

$$\mathbf{B_{56}} = -y_{12}\,\mathbf{a}_1 + (x_{12}-y_{12})\,\mathbf{a}_2 + \left(z_{12}+\tfrac{1}{3}\right)\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{12}-2y_{12})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ax_{12}\,\hat{\mathbf{y}} + c\left(z_{12}+\tfrac{1}{3}\right)\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VII}$$

$$\mathbf{B_{57}} = -(x_{12}-y_{12})\,\mathbf{a}_1 - x_{12}\,\mathbf{a}_2 + \left(z_{12}+\tfrac{2}{3}\right)\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_{12}-y_{12})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ay_{12}\,\hat{\mathbf{y}} + \tfrac{1}{3}c\,(3z_{12}+2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VII}$$

$$\mathbf{B_{58}} = y_{12}\,\mathbf{a}_1 + x_{12}\,\mathbf{a}_2 - z_{12}\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{12}+y_{12})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_{12}-y_{12})\,\hat{\mathbf{y}} - cz_{12}\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VII}$$

$$\mathbf{B_{59}} = (x_{12}-y_{12})\,\mathbf{a}_1 - y_{12}\,\mathbf{a}_2 - \left(z_{12}-\tfrac{2}{3}\right)\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{12}-2y_{12})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_{12}\,\hat{\mathbf{y}} - \tfrac{1}{3}c\,(3z_{12}-2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VII}$$

$$\mathbf{B_{60}} = -x_{12}\,\mathbf{a}_1 - (x_{12}-y_{12})\,\mathbf{a}_2 - \left(z_{12}-\tfrac{1}{3}\right)\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_{12}-y_{12})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_{12}\,\hat{\mathbf{y}} - c\left(z_{12}-\tfrac{1}{3}\right)\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VII}$$

$$\mathbf{B_{61}} = x_{13}\,\mathbf{a}_1 + y_{13}\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{13}+y_{13})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}a\,(x_{13}-y_{13})\,\hat{\mathbf{y}} + cz_{13}\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VIII}$$

$$\mathbf{B_{62}} = -y_{13}\,\mathbf{a}_1 + (x_{13}-y_{13})\,\mathbf{a}_2 + \left(z_{13}+\tfrac{1}{3}\right)\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{13}-2y_{13})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ax_{13}\,\hat{\mathbf{y}} + c\left(z_{13}+\tfrac{1}{3}\right)\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VIII}$$

$$\mathbf{B_{63}} = -(x_{13}-y_{13})\,\mathbf{a}_1 - x_{13}\,\mathbf{a}_2 + \left(z_{13}+\tfrac{2}{3}\right)\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_{13}-y_{13})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ay_{13}\,\hat{\mathbf{y}} + \tfrac{1}{3}c\,(3z_{13}+2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VIII}$$

$$\mathbf{B_{64}} = y_{13}\,\mathbf{a}_1 + x_{13}\,\mathbf{a}_2 - z_{13}\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{13}+y_{13})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_{13}-y_{13})\,\hat{\mathbf{y}} - cz_{13}\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VIII}$$

$$\mathbf{B_{65}} = (x_{13}-y_{13})\,\mathbf{a}_1 - y_{13}\,\mathbf{a}_2 - \left(z_{13}-\tfrac{2}{3}\right)\mathbf{a}_3 = \tfrac{1}{2}a\,(x_{13}-2y_{13})\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_{13}\,\hat{\mathbf{y}} - \tfrac{1}{3}c\,(3z_{13}-2)\,\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VIII}$$

$$\mathbf{B_{66}} = -x_{13}\,\mathbf{a}_1 - (x_{13}-y_{13})\,\mathbf{a}_2 - \left(z_{13}-\tfrac{1}{3}\right)\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_{13}-y_{13})\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_{13}\,\hat{\mathbf{y}} - c\left(z_{13}-\tfrac{1}{3}\right)\hat{\mathbf{z}} \quad (6c) \quad \text{Ni VIII}$$

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