$Hg_3S_2I_2$ Structure: A3B2C2_oI56_74_fhi_2ei_j-001

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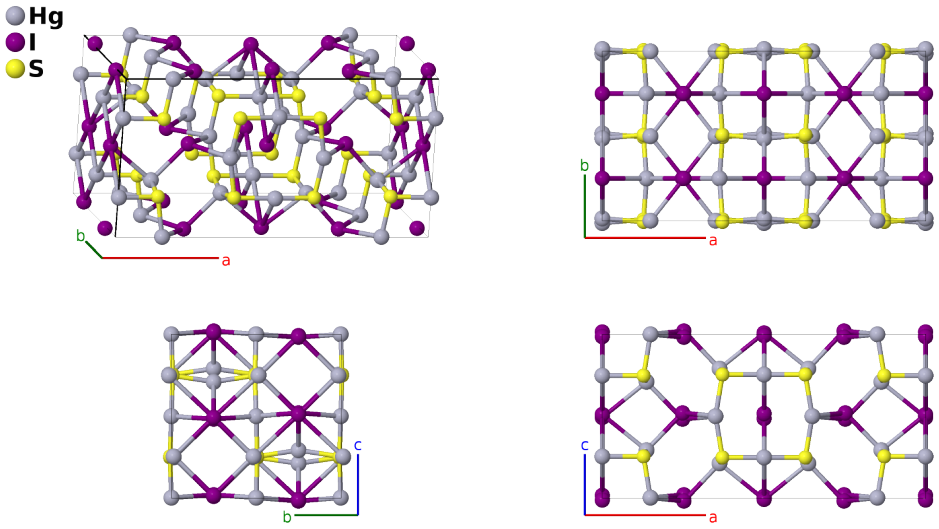
https://aflow.org/p/EXRV

https://aflow.org/p/A3B2C2_oI56_74_fhi_2ei_j-001



Prototype	$Hg_3I_2S_2$
AFLOW prototype label	A3B2C2_oI56_74_fhi_2ei_j-001
ICSD	411154
Pearson symbol	oI56
Space group number	74
Space group symbol	$Imma$
AFLOW prototype command	`aflow --proto=A3B2C2_oI56_74_fhi_2ei_j-001 --params=`$a, b/a, c/a, z_1, z_2, x_3, y_4, z_4, x_5, z_5, x_6, z_6, x_7, y_7, z_7$

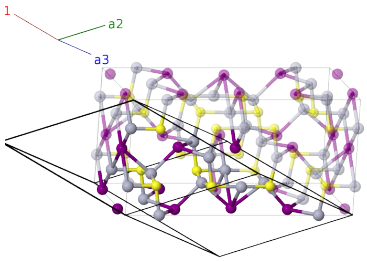
Other compounds with this structure

$Hg_3Se_2I_2$

- FINDSYM rotated this structure by 90° about the z-axis and shifted the origin by $(\mathbf{a}_1 + \mathbf{a}_2 + \mathbf{a}_3)/4$ compared to the structure in (Beck, 2000).

Body-centered Orthorhombic primitive vectors

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



Basis vectors

		Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B_1}$	=	$\left(z_1+\frac{1}{4}\right)\,\mathbf{a}_1+z_1\,\mathbf{a}_2+\frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{4}b\,\hat{\mathbf{y}}+cz_1\,\hat{\mathbf{z}}$	(4e)	I I
$\mathbf{B_2}$	=	$-\left(z_1-\frac{3}{4}\right)\,\mathbf{a}_1-z_1\,\mathbf{a}_2+\frac{3}{4}\,\mathbf{a}_3$	=	$\frac{3}{4}b\,\hat{\mathbf{y}}-cz_1\,\hat{\mathbf{z}}$	(4e)	I I
$\mathbf{B_3}$	=	$\left(z_2+\frac{1}{4}\right)\,\mathbf{a}_1+z_2\,\mathbf{a}_2+\frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{4}b\,\hat{\mathbf{y}}+cz_2\,\hat{\mathbf{z}}$	(4e)	I II
$\mathbf{B_4}$	=	$-\left(z_2-\frac{3}{4}\right)\,\mathbf{a}_1-z_2\,\mathbf{a}_2+\frac{3}{4}\,\mathbf{a}_3$	=	$\frac{3}{4}b\,\hat{\mathbf{y}}-cz_2\,\hat{\mathbf{z}}$	(4e)	I II
$\mathbf{B_5}$	=	$x_3\,\mathbf{a}_2+x_3\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}}$	(8f)	Hg I
$\mathbf{B_6}$	=	$\frac{1}{2}\,\mathbf{a}_1-x_3\,\mathbf{a}_2-\left(x_3-\frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}}+\frac{1}{2}b\,\hat{\mathbf{y}}$	(8f)	Hg I
$\mathbf{B_7}$	=	$-x_3\,\mathbf{a}_2-x_3\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}}$	(8f)	Hg I
$\mathbf{B_8}$	=	$\frac{1}{2}\,\mathbf{a}_1+x_3\,\mathbf{a}_2+\left(x_3+\frac{1}{2}\right)\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}}+\frac{1}{2}b\,\hat{\mathbf{y}}$	(8f)	Hg I
$\mathbf{B_9}$	=	$(y_4+z_4)\,\mathbf{a}_1+z_4\,\mathbf{a}_2+y_4\,\mathbf{a}_3$	=	$by_4\,\hat{\mathbf{y}}+cz_4\,\hat{\mathbf{z}}$	(8h)	Hg II
$\mathbf{B_{10}}$	=	$\left(-y_4+z_4+\frac{1}{2}\right)\,\mathbf{a}_1+z_4\,\mathbf{a}_2-\left(y_4-\frac{1}{2}\right)\,\mathbf{a}_3$	=	$-b\left(y_4-\frac{1}{2}\right)\,\hat{\mathbf{y}}+cz_4\,\hat{\mathbf{z}}$	(8h)	Hg II
$\mathbf{B_{11}}$	=	$\left(y_4-z_4+\frac{1}{2}\right)\,\mathbf{a}_1-z_4\,\mathbf{a}_2+\left(y_4+\frac{1}{2}\right)\,\mathbf{a}_3$	=	$b\left(y_4+\frac{1}{2}\right)\,\hat{\mathbf{y}}-cz_4\,\hat{\mathbf{z}}$	(8h)	Hg II
$\mathbf{B_{12}}$	=	$-(y_4+z_4)\,\mathbf{a}_1-z_4\,\mathbf{a}_2-y_4\,\mathbf{a}_3$	=	$-by_4\,\hat{\mathbf{y}}-cz_4\,\hat{\mathbf{z}}$	(8h)	Hg II
$\mathbf{B_{13}}$	=	$\left(z_5+\frac{1}{4}\right)\,\mathbf{a}_1+(x_5+z_5)\,\mathbf{a}_2+\left(x_5+\frac{1}{4}\right)\,\mathbf{a}_3$	=	$ax_5\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_5\,\hat{\mathbf{z}}$	(8i)	Hg III
$\mathbf{B_{14}}$	=	$\left(z_5+\frac{1}{4}\right)\,\mathbf{a}_1-(x_5-z_5)\,\mathbf{a}_2-\left(x_5-\frac{1}{4}\right)\,\mathbf{a}_3$	=	$-ax_5\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_5\,\hat{\mathbf{z}}$	(8i)	Hg III
$\mathbf{B_{15}}$	=	$-\left(z_5-\frac{3}{4}\right)\,\mathbf{a}_1-(x_5+z_5)\,\mathbf{a}_2-\left(x_5-\frac{3}{4}\right)\,\mathbf{a}_3$	=	$-ax_5\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_5\,\hat{\mathbf{z}}$	(8i)	Hg III
$\mathbf{B_{16}}$	=	$-\left(z_5-\frac{3}{4}\right)\,\mathbf{a}_1+(x_5-z_5)\,\mathbf{a}_2+\left(x_5+\frac{3}{4}\right)\,\mathbf{a}_3$	=	$ax_5\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_5\,\hat{\mathbf{z}}$	(8i)	Hg III
$\mathbf{B_{17}}$	=	$\left(z_6+\frac{1}{4}\right)\,\mathbf{a}_1+(x_6+z_6)\,\mathbf{a}_2+\left(x_6+\frac{1}{4}\right)\,\mathbf{a}_3$	=	$ax_6\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}}$	(8i)	I III
$\mathbf{B_{18}}$	=	$\left(z_6+\frac{1}{4}\right)\,\mathbf{a}_1-(x_6-z_6)\,\mathbf{a}_2-\left(x_6-\frac{1}{4}\right)\,\mathbf{a}_3$	=	$-ax_6\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}}$	(8i)	I III
$\mathbf{B_{19}}$	=	$-\left(z_6-\frac{3}{4}\right)\,\mathbf{a}_1-(x_6+z_6)\,\mathbf{a}_2-\left(x_6-\frac{3}{4}\right)\,\mathbf{a}_3$	=	$-ax_6\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}}$	(8i)	I III
$\mathbf{B_{20}}$	=	$-\left(z_6-\frac{3}{4}\right)\,\mathbf{a}_1+(x_6-z_6)\,\mathbf{a}_2+\left(x_6+\frac{3}{4}\right)\,\mathbf{a}_3$	=	$ax_6\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}}$	(8i)	I III
$\mathbf{B_{21}}$	=	$(y_7+z_7)\,\mathbf{a}_1+(x_7+z_7)\,\mathbf{a}_2+(x_7+y_7)\,\mathbf{a}_3$	=	$ax_7\,\hat{\mathbf{x}}+by_7\,\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}}$	(16j)	S I
$\mathbf{B_{22}}$	=	$\left(-y_7+z_7+\frac{1}{2}\right)\,\mathbf{a}_1-(x_7-z_7)\,\mathbf{a}_2-\left(x_7+y_7-\frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_7\,\hat{\mathbf{x}}-b\left(y_7-\frac{1}{2}\right)\,\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}}$	(16j)	S I
$\mathbf{B_{23}}$	=	$\left(y_7-z_7+\frac{1}{2}\right)\,\mathbf{a}_1-(x_7+z_7)\,\mathbf{a}_2+\left(-x_7+y_7+\frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_7\,\hat{\mathbf{x}}+b\left(y_7+\frac{1}{2}\right)\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}}$	(16j)	S I
$\mathbf{B_{24}}$	=	$-(y_7+z_7)\,\mathbf{a}_1+(x_7-z_7)\,\mathbf{a}_2+(x_7-y_7)\,\mathbf{a}_3$	=	$ax_7\,\hat{\mathbf{x}}-by_7\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}}$	(16j)	S I
$\mathbf{B_{25}}$	=	$-(y_7+z_7)\,\mathbf{a}_1-(x_7+z_7)\,\mathbf{a}_2-(x_7+y_7)\,\mathbf{a}_3$	=	$-ax_7\,\hat{\mathbf{x}}-by_7\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}}$	(16j)	S I
$\mathbf{B_{26}}$	=	$\left(y_7-z_7+\frac{1}{2}\right)\,\mathbf{a}_1+(x_7-z_7)\,\mathbf{a}_2+\left(x_7+y_7+\frac{1}{2}\right)\,\mathbf{a}_3$	=	$ax_7\,\hat{\mathbf{x}}+b\left(y_7+\frac{1}{2}\right)\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}}$	(16j)	S I

$\mathbf{B_{27}}$	=	$\left(-y_7 + z_7 + \frac{1}{2}\right)\,\mathbf{a}_1 + (x_7 + z_7)\,\mathbf{a}_2 + \left(x_7 - y_7 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$ax_7\,\hat{\mathbf{x}} - b\left(y_7 - \frac{1}{2}\right)\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}}$	(16j)	S I
$\mathbf{B_{28}}$	=	$(y_7 + z_7)\,\mathbf{a}_1 - (x_7 - z_7)\,\mathbf{a}_2 - (x_7 - y_7)\,\mathbf{a}_3$	=	$-ax_7\,\hat{\mathbf{x}} + by_7\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}}$	(16j)	S I

References

[1] J. Beck and S. Hedderich, *Synthesis and Crystal Structure of $Hg_3S_2I_2$ and $Hg_3Se_2I_2$, New Members of the $Hg_3E_2X_2$ Family*, Journal of Solid State Chemistry **151**, 73–76 (2000), doi:10.1006/jssc.1999.8624.