

$P422$

$D_4^1$

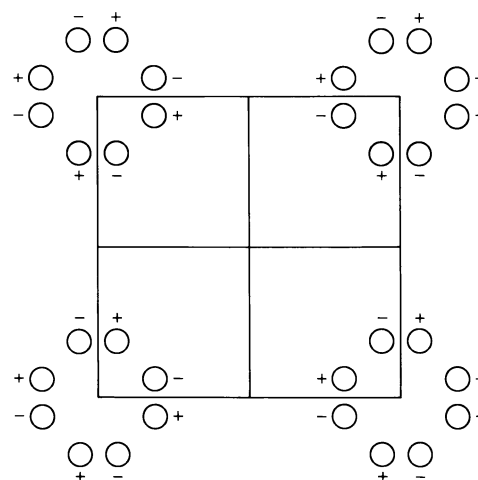
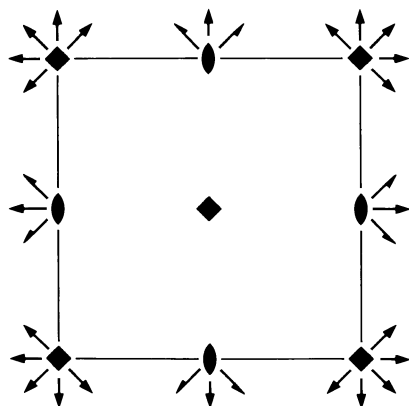
422

Tetragonal

No. 89

$P422$

Patterson symmetry  $P4/mmm$



Origin at 422

Asymmetric unit  $0 \leq x \leq \frac{1}{2}; 0 \leq y \leq \frac{1}{2}; 0 \leq z \leq \frac{1}{2}$

Symmetry operations

- |                 |                 |                     |                       |
|-----------------|-----------------|---------------------|-----------------------|
| (1) 1           | (2) 2 $0, 0, z$ | (3) $4^+$ $0, 0, z$ | (4) $4^-$ $0, 0, z$   |
| (5) 2 $0, y, 0$ | (6) 2 $x, 0, 0$ | (7) 2 $x, x, 0$     | (8) 2 $x, \bar{x}, 0$ |

**Generators selected**  $(1); t(1,0,0); t(0,1,0); t(0,0,1); (2); (3); (5)$

**Positions**

Multiplicity, Wyckoff letter, Site symmetry		Coordinates				Reflection conditions
8	<i>p</i> 1	(1) $x, y, z$ (5) $\bar{x}, y, \bar{z}$	(2) $\bar{x}, \bar{y}, z$ (6) $x, \bar{y}, \bar{z}$	(3) $\bar{y}, x, z$ (7) $y, x, \bar{z}$	(4) $y, \bar{x}, z$ (8) $\bar{y}, \bar{x}, \bar{z}$	General: no conditions  Special:
4	<i>o</i> .2.	$x, \frac{1}{2}, 0$	$\bar{x}, \frac{1}{2}, 0$	$\frac{1}{2}, x, 0$	$\frac{1}{2}, \bar{x}, 0$	no extra conditions
4	<i>n</i> .2.	$x, 0, \frac{1}{2}$	$\bar{x}, 0, \frac{1}{2}$	$0, x, \frac{1}{2}$	$0, \bar{x}, \frac{1}{2}$	no extra conditions
4	<i>m</i> .2.	$x, \frac{1}{2}, \frac{1}{2}$	$\bar{x}, \frac{1}{2}, \frac{1}{2}$	$\frac{1}{2}, x, \frac{1}{2}$	$\frac{1}{2}, \bar{x}, \frac{1}{2}$	no extra conditions
4	<i>l</i> .2.	$x, 0, 0$	$\bar{x}, 0, 0$	$0, x, 0$	$0, \bar{x}, 0$	no extra conditions
4	<i>k</i> ..2	$x, x, \frac{1}{2}$	$\bar{x}, \bar{x}, \frac{1}{2}$	$\bar{x}, x, \frac{1}{2}$	$x, \bar{x}, \frac{1}{2}$	no extra conditions
4	<i>j</i> ..2	$x, x, 0$	$\bar{x}, \bar{x}, 0$	$\bar{x}, x, 0$	$x, \bar{x}, 0$	no extra conditions
4	<i>i</i> 2..	$0, \frac{1}{2}, z$	$\frac{1}{2}, 0, z$	$0, \frac{1}{2}, \bar{z}$	$\frac{1}{2}, 0, \bar{z}$	<i>hkl</i> : $h + k = 2n$
2	<i>h</i> 4..	$\frac{1}{2}, \frac{1}{2}, z$	$\frac{1}{2}, \frac{1}{2}, \bar{z}$			no extra conditions
2	<i>g</i> 4..	$0, 0, z$	$0, 0, \bar{z}$			no extra conditions
2	<i>f</i> 222.	$\frac{1}{2}, 0, \frac{1}{2}$	$0, \frac{1}{2}, \frac{1}{2}$			<i>hkl</i> : $h + k = 2n$
2	<i>e</i> 222.	$\frac{1}{2}, 0, 0$	$0, \frac{1}{2}, 0$			<i>hkl</i> : $h + k = 2n$
1	<i>d</i> 422	$\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$				no extra conditions
1	<i>c</i> 422	$\frac{1}{2}, \frac{1}{2}, 0$				no extra conditions
1	<i>b</i> 422	$0, 0, \frac{1}{2}$				no extra conditions
1	<i>a</i> 422	$0, 0, 0$				no extra conditions

**Symmetry of special projections**

Along [001]  $p4mm$

$\mathbf{a}' = \mathbf{a}$   $\mathbf{b}' = \mathbf{b}$

Origin at  $0, 0, z$

Along [100]  $p2mm$

$\mathbf{a}' = \mathbf{b}$   $\mathbf{b}' = \mathbf{c}$

Origin at  $x, 0, 0$

Along [110]  $p2mm$

$\mathbf{a}' = \frac{1}{2}(-\mathbf{a} + \mathbf{b})$   $\mathbf{b}' = \mathbf{c}$

Origin at  $x, x, 0$