

*I*422

$D_4^9$

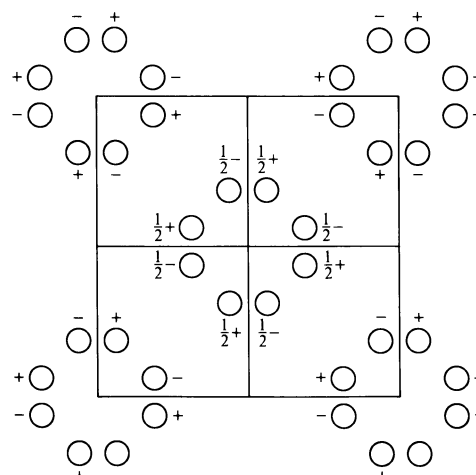
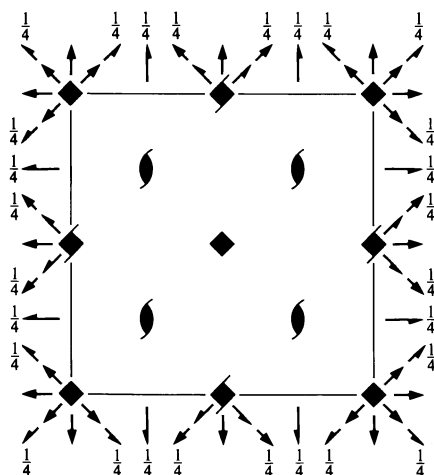
422

Tetragonal

No. 97

*I*422

Patterson symmetry *I*4/*m**m**m*



Origin at 422

Asymmetric unit  $0 \leq x \leq \frac{1}{2}; 0 \leq y \leq \frac{1}{2}; 0 \leq z \leq \frac{1}{4}$

**Symmetry operations**

For (0,0,0)+ set

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

For ( $\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$ )+ set

- |   |  |  |  |
|---|--|--|--|
| (1) $t(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$            | (2) 2(0,0, $\frac{1}{2}$ ) $\frac{1}{4}, \frac{1}{4}, z$   | (3) 4 <sup>+</sup> (0,0, $\frac{1}{2}$ ) $0, \frac{1}{2}, z$ | (4) 4 <sup>-</sup> (0,0, $\frac{1}{2}$ ) $\frac{1}{2}, 0, z$ |
| (5) 2(0, $\frac{1}{2}, 0$ ) $\frac{1}{4}, y, \frac{1}{4}$ | (6) 2( $\frac{1}{2}, 0, 0$ ) $x, \frac{1}{4}, \frac{1}{4}$ | (7) 2( $\frac{1}{2}, \frac{1}{2}, 0$ ) $x, x, \frac{1}{4}$   | (8) 2 $x, \bar{x} + \frac{1}{2}, \frac{1}{4}$                |

**Generators selected** (1);  $t(1,0,0)$ ;  $t(0,1,0)$ ;  $t(0,0,1)$ ;  $t(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$ ; (2); (3); (5)

**Positions**

Multiplicity,  
Wyckoff letter,  
Site symmetry

Coordinates

$(0,0,0) + (\frac{1}{2}, \frac{1}{2}, \frac{1}{2}) +$

Reflection conditions

General:

16 *k* 1 (1)  $x, y, z$  (2)  $\bar{x}, \bar{y}, z$  (3)  $\bar{y}, x, z$  (4)  $y, \bar{x}, z$   
(5)  $\bar{x}, y, \bar{z}$  (6)  $x, \bar{y}, \bar{z}$  (7)  $y, x, \bar{z}$  (8)  $\bar{y}, \bar{x}, \bar{z}$

$hkl: h + k + l = 2n$

$hk0: h + k = 2n$

$0kl: k + l = 2n$

$hhl: l = 2n$

$00l: l = 2n$

$h00: h = 2n$

Special: as above, plus

8 *j* ..2  $x, x + \frac{1}{2}, \frac{1}{4}$   $\bar{x}, \bar{x} + \frac{1}{2}, \frac{1}{4}$   $\bar{x} + \frac{1}{2}, x, \frac{1}{4}$   $x + \frac{1}{2}, \bar{x}, \frac{1}{4}$

$0kl: k = 2n$

8 *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

8 *h* .2.  $x, 0, 0$   $\bar{x}, 0, 0$   $0, x, 0$   $0, \bar{x}, 0$

no extra conditions

8 *g* ..2  $x, x, 0$   $\bar{x}, \bar{x}, 0$   $\bar{x}, x, 0$   $x, \bar{x}, 0$

no extra conditions

8 *f* 2..  $0, \frac{1}{2}, z$   $\frac{1}{2}, 0, z$   $0, \frac{1}{2}, \bar{z}$   $\frac{1}{2}, 0, \bar{z}$

$hkl: l = 2n$

4 *e* 4..  $0, 0, z$   $0, 0, \bar{z}$

no extra conditions

4 *d* 2.22  $0, \frac{1}{2}, \frac{1}{4}$   $\frac{1}{2}, 0, \frac{1}{4}$

$hkl: l = 2n$

4 *c* 222.  $0, \frac{1}{2}, 0$   $\frac{1}{2}, 0, 0$

$hkl: l = 2n$

2 *b* 422  $0, 0, \frac{1}{2}$

no extra conditions

2 *a* 422  $0, 0, 0$

no extra conditions

**Symmetry of special projections**

Along [001]  $p4mm$

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

Origin at  $0, 0, z$

Along [100]  $c2mm$

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

Origin at  $x, 0, 0$

Along [110]  $p2mm$

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

Origin at  $x, x, 0$