

$p312$

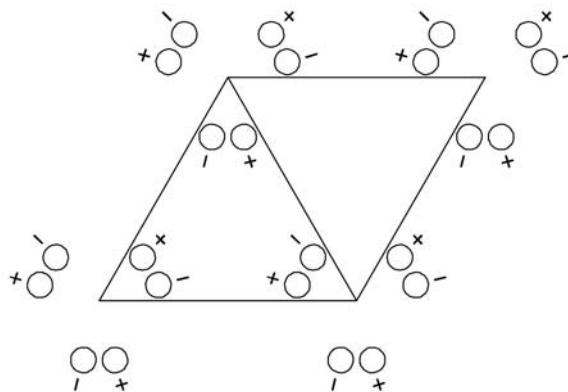
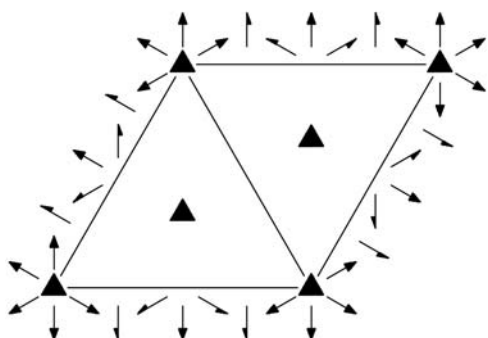
312

Trigonal/Hexagonal

No. 67

$p312$

Patterson symmetry  $p\bar{3}1m$



Origin at 312

**Asymmetric unit**  $0 \leq x \leq \frac{2}{3}; 0 \leq y \leq \frac{2}{3}; x \leq (1+y)/2; y \leq \min(1-x, (1+x)/2); 0 \leq z$   
**Vertices**  $0,0 \quad \frac{1}{2},0 \quad \frac{2}{3},\frac{1}{3} \quad \frac{1}{3},\frac{2}{3} \quad 0,\frac{1}{2}$

**Symmetry operations**

- |  |                                    |   |
|--|------------------------------------|---|
| (1) 1<br>(1 0,0,0)                     | (2) $3^+$ 0,0,z<br>( $3_z$  0,0,0) | (3) $3^-$ 0,0,z<br>( $3_z^{-1}$  0,0,0) |
| (4) 2 $x,\bar{x},0$<br>( $2_3$  0,0,0) | (5) 2 $x,2x,0$<br>( $2_2$  0,0,0)  | (6) 2 $2x,x,0$<br>( $2_1$  0,0,0)       |

**Generators selected** (1);  $t(1,0,0)$ ;  $t(0,1,0)$ ; (2); (4)

**Positions**

Multiplicity, Wyckoff letter, Site symmetry			Coordinates			Reflection conditions
6	<i>h</i>	1	(1) $x, y, z$ (4) $\bar{y}, \bar{x}, \bar{z}$	(2) $\bar{y}, x - y, z$ (5) $\bar{x} + y, y, \bar{z}$	(3) $\bar{x} + y, \bar{x}, z$ (6) $x, x - y, \bar{z}$	General: no conditions  Special: no extra conditions
3	<i>g</i>	..2	$x, \bar{x}, 0$	$x, 2x, 0$	$2\bar{x}, \bar{x}, 0$	
2	<i>f</i>	3..	$\frac{2}{3}, \frac{1}{3}, z$	$\frac{2}{3}, \frac{1}{3}, \bar{z}$		
2	<i>e</i>	3..	$\frac{1}{3}, \frac{2}{3}, z$	$\frac{1}{3}, \frac{2}{3}, \bar{z}$		
2	<i>d</i>	3..	$0, 0, z$	$0, 0, \bar{z}$		
1	<i>c</i>	3.2	$\frac{2}{3}, \frac{1}{3}, 0$			
1	<i>b</i>	3.2	$\frac{1}{3}, \frac{2}{3}, 0$			
1	<i>a</i>	3.2	$0, 0, 0$			

**Symmetry of special projections**

Along [001]  $p3m1$

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

Origin at  $0, 0, z$

Along [100]  $\bar{1}11m$

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

Origin at  $x, 0, 0$

Along [210]  $\bar{1}211$

$\mathbf{a}' = \frac{1}{2}\mathbf{b}$

Origin at  $x, \frac{1}{2}x, 0$

**Maximal non-isotypic subgroups**

**I** [2]  $p311$  ( $p3, 65$ ) 1; 2; 3  
 [3]  $p112$  ( $c211, 10$ ) 1; 4  
 [3]  $p112$  ( $c211, 10$ ) 1; 5  
 [3]  $p112$  ( $c211, 10$ ) 1; 6

**IIa** none

**IIb** [3]  $h312$  ( $\mathbf{a}' = 3\mathbf{a}, \mathbf{b}' = 3\mathbf{b}$ ) ( $p321, 68$ )

**Maximal isotypic subgroups of lowest index**

**IIc** [4]  $p312$  ( $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}$ ) (67)

**Minimal non-isotypic supergroups**

**I** [2]  $p\bar{3}1m$  (71); [2]  $p622$  (76); [2]  $p\bar{6}m2$  (78)

**II** [2]  $h312$  ( $p321, 68$ )