

$C_{3v}^2$ 
 $P31m$ 

No. 157

 $P31m$ 
**Generators selected** (1);  $t(1,0,0)$ ;  $t(0,1,0)$ ;  $t(0,0,1)$ ; (2); (4)

**General position**

 Multiplicity,  
 Wyckoff letter,  
 Site symmetry

Coordinates

 6  $d$  1

 (1)  $x, y, z$  (2)  $\bar{y}, x - y, z$  (3)  $\bar{x} + y, \bar{x}, z$   
 (4)  $y, x, z$  (5)  $x - y, \bar{y}, z$  (6)  $\bar{x}, \bar{x} + y, z$ 
**I Maximal translationengleiche subgroups**

|                           |         |   |
|---------------------------|---------|---|
| [2] $P311$ (143, $P3$ )   | 1; 2; 3 |   |
| { [3] $P11m$ (8, $C1m1$ ) | 1; 4    | $-\mathbf{a} - \mathbf{b}, \mathbf{a} - \mathbf{b}, \mathbf{c}$ |
| [3] $P11m$ (8, $C1m1$ )   | 1; 5    | $\mathbf{a}, \mathbf{a} + 2\mathbf{b}, \mathbf{c}$              |
| [3] $P11m$ (8, $C1m1$ )   | 1; 6    | $\mathbf{b}, -2\mathbf{a} - \mathbf{b}, \mathbf{c}$             |

**II Maximal klassengleiche subgroups**

## • Enlarged unit cell

|   |   |   |         |
|---|---|---|---------|
| [2] $\mathbf{c}' = 2\mathbf{c}$   |   |   |         |
| $P31c$ (159)  | $\langle 2; 4 + (0, 0, 1) \rangle$              | $\mathbf{a}, \mathbf{b}, 2\mathbf{c}$                             |         |
| $P31m$ (157)  | $\langle 2; 4 \rangle$                          | $\mathbf{a}, \mathbf{b}, 2\mathbf{c}$                             |         |
| [3] $\mathbf{c}' = 3\mathbf{c}$   |   |   |         |
| $P31m$ (157)  | $\langle 2; 4 \rangle$                          | $\mathbf{a}, \mathbf{b}, 3\mathbf{c}$                             |         |
| [3] $\mathbf{a}' = 3\mathbf{a}, \mathbf{b}' = 3\mathbf{b}$  |   |   |         |
| $H31m$ (156, $P3m1$ )   | $\langle 2; 4 \rangle$                          | $\mathbf{a} - \mathbf{b}, \mathbf{a} + 2\mathbf{b}, \mathbf{c}$   |         |
| [3] $\mathbf{a}' = \mathbf{a} - \mathbf{b}, \mathbf{b}' = \mathbf{a} + 2\mathbf{b}, \mathbf{c}' = 3\mathbf{c}$  |   |   |         |
| $R3m$ (160)   | $\langle 2; 4 \rangle$                          | $\mathbf{a} - \mathbf{b}, \mathbf{a} + 2\mathbf{b}, 3\mathbf{c}$  |         |
| [3] $\mathbf{a}' = 2\mathbf{a} + \mathbf{b}, \mathbf{b}' = -\mathbf{a} + \mathbf{b}, \mathbf{c}' = 3\mathbf{c}$ |   |   |         |
| $R3m$ (160)   | $\langle 2; 4 \rangle$                          | $2\mathbf{a} + \mathbf{b}, -\mathbf{a} + \mathbf{b}, 3\mathbf{c}$ |         |
| [4] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}$  |   |   |         |
| $P31m$ (157)  | $\langle 2; 4 \rangle$                          | $2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$                            |         |
| $P31m$ (157)  | $\langle (2; 4) + (1, -1, 0) \rangle$           | $2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$                            | 1, 0, 0 |
| $P31m$ (157)  | $\langle 2 + (1, 2, 0); 4 + (-1, 1, 0) \rangle$ | $2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$                            | 0, 1, 0 |
| $P31m$ (157)  | $\langle 4; 2 + (2, 1, 0) \rangle$              | $2\mathbf{a}, 2\mathbf{b}, \mathbf{c}$                            | 1, 1, 0 |

## • Series of maximal isomorphic subgroups

|  |   |  |           |
|--|---|--|-----------|
| [ $p$ ] $\mathbf{c}' = p\mathbf{c}$                              |   |  |           |
| $P31m$ (157)   | $\langle 2; 4 \rangle$  | $\mathbf{a}, \mathbf{b}, p\mathbf{c}$  |           |
|  | $p > 1$   |  |           |
|  | no conjugate subgroups  |  |           |
| [ $p^2$ ] $\mathbf{a}' = p\mathbf{a}, \mathbf{b}' = p\mathbf{b}$ |   |  |           |
| $P31m$ (157)   | $\langle 2 + (u + v, -u + 2v, 0); 4 + (u - v, -u + v, 0) \rangle$ | $p\mathbf{a}, p\mathbf{b}, \mathbf{c}$ | $u, v, 0$ |
|  | $p > 1; p \neq 3; 0 \leq u < p; 0 \leq v < p$                     |  |           |
|  | $p^2$ conjugate subgroups for the prime $p$                       |  |           |

**I Minimal translationengleiche supergroups**

 [2]  $P\bar{3}1m$  (162); [2]  $P6mm$  (183); [2]  $P6_3cm$  (185); [2]  $P\bar{6}2m$  (189)

**II Minimal non-isomorphic klassengleiche supergroups**

## • Additional centring translations

 [3]  $H31m$  (156,  $P3m1$ )

## • Decreased unit cell

none