

$R3c$

C_{3v}^6

$3m$

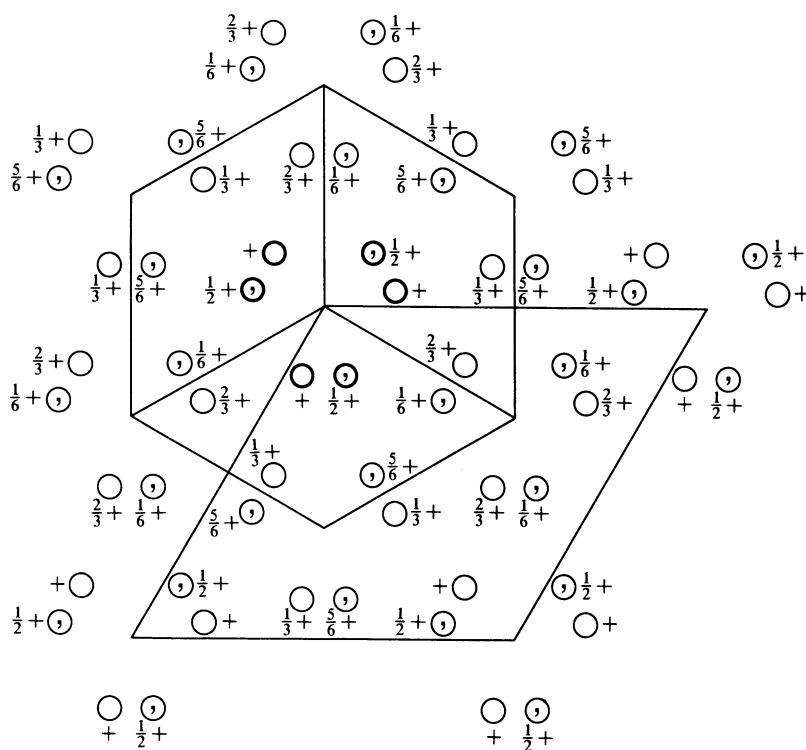
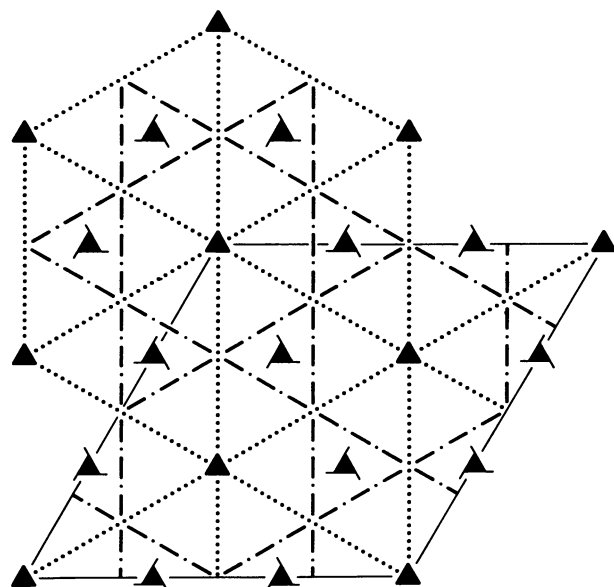
Trigonal

No. 161

$R3c$

Patterson symmetry $R\bar{3}m$

HEXAGONAL AXES



Origin on $3c$

Asymmetric unit $0 \leq x \leq \frac{2}{3}; 0 \leq y \leq \frac{2}{3}; 0 \leq z \leq \frac{1}{6}; x \leq (1+y)/2; y \leq \min(1-x, (1+x)/2)$
Vertices $0, 0, 0 \quad \frac{1}{2}, 0, 0 \quad \frac{2}{3}, \frac{1}{3}, 0 \quad \frac{1}{3}, \frac{2}{3}, 0 \quad 0, \frac{1}{2}, 0$
 $0, 0, \frac{1}{6} \quad \frac{1}{2}, 0, \frac{1}{6} \quad \frac{2}{3}, \frac{1}{3}, \frac{1}{6} \quad \frac{1}{3}, \frac{2}{3}, \frac{1}{6} \quad 0, \frac{1}{2}, \frac{1}{6}$

Symmetry operations

For $(0, 0, 0)+$ set

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

For $(\frac{2}{3}, \frac{1}{3}, \frac{1}{3})+$ set

- | | | |
|---|---|---|
| (1) $t(\frac{2}{3}, \frac{1}{3}, \frac{1}{3})$ | (2) $3^+(0, 0, \frac{1}{3}) \ \frac{1}{3}, \frac{1}{3}, z$ | (3) $3^-(0, 0, \frac{1}{3}) \ \frac{1}{3}, 0, z$ |
| (4) $g(\frac{1}{6}, -\frac{1}{6}, \frac{5}{6}) \ x + \frac{1}{2}, \bar{x}, z$ | (5) $g(\frac{1}{6}, \frac{1}{3}, \frac{5}{6}) \ x + \frac{1}{4}, 2x, z$ | (6) $g(\frac{2}{3}, \frac{1}{3}, \frac{5}{6}) \ 2x, x, z$ |

For $(\frac{1}{3}, \frac{2}{3}, \frac{2}{3})+$ set

- | | | |
|---|---|---|
| (1) $t(\frac{1}{3}, \frac{2}{3}, \frac{2}{3})$ | (2) $3^+(0, 0, \frac{2}{3}) \ 0, \frac{1}{3}, z$ | (3) $3^-(0, 0, \frac{2}{3}) \ \frac{1}{3}, \frac{1}{3}, z$ |
| (4) $g(-\frac{1}{6}, \frac{1}{6}, \frac{1}{6}) \ x + \frac{1}{2}, \bar{x}, z$ | (5) $g(\frac{1}{3}, \frac{2}{3}, \frac{1}{6}) \ x, 2x, z$ | (6) $g(\frac{1}{3}, \frac{1}{6}, \frac{1}{6}) \ 2x - \frac{1}{2}, x, z$ |

Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; $t(\frac{2}{3}, \frac{1}{3}, \frac{1}{3})$; (2); (4)

Positions

Multiplicity,
Wyckoff letter,
Site symmetry

Coordinates

 $(0,0,0)+ (\frac{2}{3}, \frac{1}{3}, \frac{1}{3})+ (\frac{1}{3}, \frac{2}{3}, \frac{2}{3})+$

18 *b* 1 (1) x, y, z (2) $\bar{y}, x - y, z$ (3) $\bar{x} + y, \bar{x}, z$
(4) $\bar{y}, \bar{x}, z + \frac{1}{2}$ (5) $\bar{x} + y, y, z + \frac{1}{2}$ (6) $x, x - y, z + \frac{1}{2}$

Reflection conditions

General:

$hkil$: $-h + k + l = 3n$
 $hki0$: $-h + k = 3n$
 $hh\bar{2}hl$: $l = 3n$
 $h\bar{h}0l$: $h + l = 3n, l = 2n$
 $000l$: $l = 6n$
 $h\bar{h}00$: $h = 3n$

Special: as above, plus

 $hkil$: $l = 2n$

6 *a* 3. 0,0,*z* 0,0, $z + \frac{1}{2}$

Symmetry of special projectionsAlong [001] $p31m$

$\mathbf{a}' = \frac{1}{3}(2\mathbf{a} + \mathbf{b})$ $\mathbf{b}' = \frac{1}{3}(-\mathbf{a} + \mathbf{b})$
Origin at 0,0,*z*

Along [100] $p1$

$\mathbf{a}' = \frac{1}{6}(2\mathbf{a} + 4\mathbf{b} + \mathbf{c})$ $\mathbf{b}' = \frac{1}{6}(-\mathbf{a} - 2\mathbf{b} + \mathbf{c})$
Origin at $x, 0, 0$

Along [210] $p1g1$

$\mathbf{a}' = \frac{1}{2}\mathbf{b}$ $\mathbf{b}' = \frac{1}{2}\mathbf{c}$
Origin at $x, \frac{1}{2}x, 0$

Maximal non-isomorphic subgroups

I [2] $R31 (R3, 146)$ (1; 2; 3)+
{ [3] $R1c (Cc, 9)$ (1; 4)+
[3] $R1c (Cc, 9)$ (1; 5)+
[3] $R1c (Cc, 9)$ (1; 6)+

IIa [3] $P3c1 (158)$ 1; 2; 3; 4; 5; 6

IIb none

Maximal isomorphic subgroups of lowest index

IIc [4] $R3c (\mathbf{a}' = -2\mathbf{a}, \mathbf{b}' = -2\mathbf{b}) (161)$; [5] $R3c (\mathbf{a}' = -\mathbf{a}, \mathbf{b}' = -\mathbf{b}, \mathbf{c}' = 5\mathbf{c}) (161)$

Minimal non-isomorphic supergroups

I [2] $R\bar{3}c (167)$; [4] $P\bar{4}3n (218)$; [4] $F\bar{4}3c (219)$; [4] $I\bar{4}3d (220)$

II [2] $R3m (\mathbf{a}' = -\mathbf{a}, \mathbf{b}' = -\mathbf{b}, \mathbf{c}' = \frac{1}{2}\mathbf{c}) (160)$; [3] $P31c (\mathbf{a}' = \frac{1}{3}(2\mathbf{a} + \mathbf{b}), \mathbf{b}' = \frac{1}{3}(-\mathbf{a} + \mathbf{b}), \mathbf{c}' = \frac{1}{3}\mathbf{c}) (159)$