

Trigonal

3

C_3^4

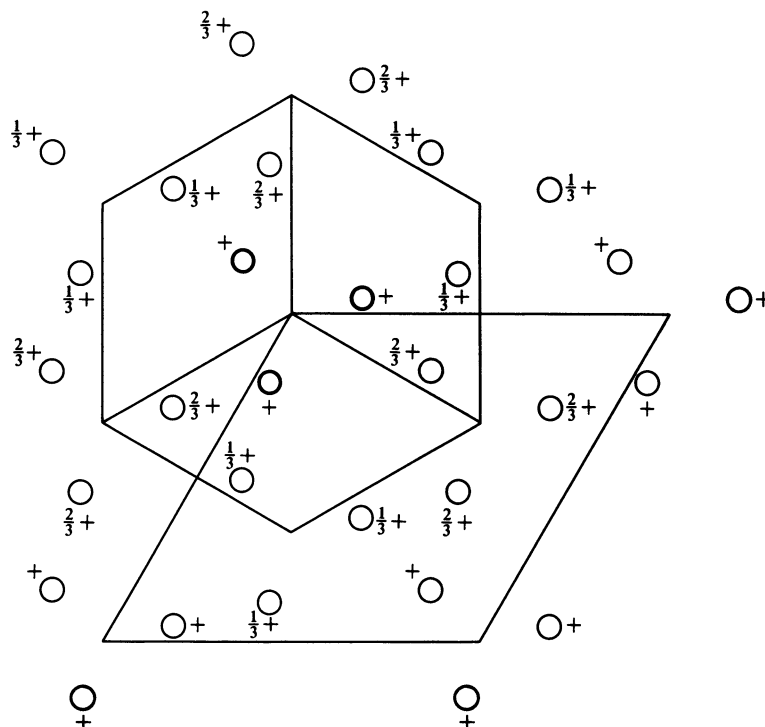
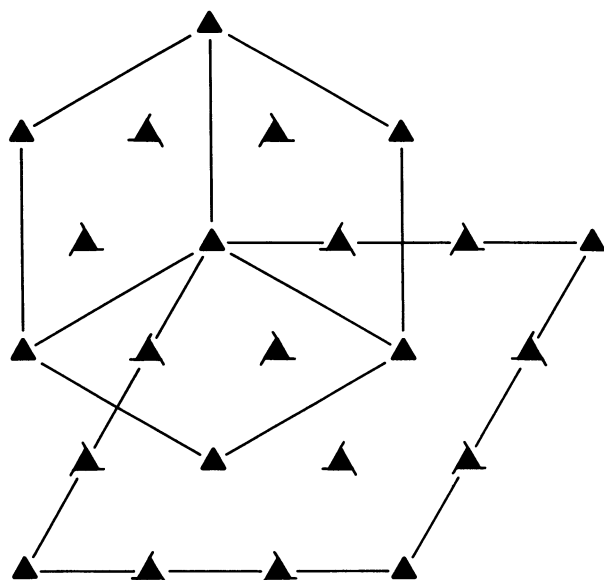
$R\bar{3}$

Patterson symmetry $R\bar{3}$

$R\bar{3}$

No. 146

HEXAGONAL AXES



Origin on 3

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

Symmetry operations

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

- (1) 1
- (2) $3^+ 0, 0, z$
- (3) $3^- 0, 0, z$

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) $3^-(0, 0, \frac{1}{3}) \frac{1}{3}, 0, z$

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) $3^-(0, 0, \frac{2}{3}) \frac{1}{3}, \frac{1}{3}, z$

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)

Positions

Multiplicity, Wyckoff letter, Site symmetry	Coordinates	Reflection conditions
9 <i>b</i> 1	$(0, 0, 0)+$ $(\frac{2}{3}, \frac{1}{3}, \frac{1}{3})+$ $(\frac{1}{3}, \frac{2}{3}, \frac{2}{3})+$	General: $hkl:$ $-h+k+l=3n$ $hki0:$ $-h+k=3n$ $hh\bar{2}hl:$ $l=3n$ $h\bar{h}0l:$ $h+l=3n$ $000l:$ $l=3n$ $h\bar{h}00:$ $h=3n$ Special: no extra conditions
3 <i>a</i> 3.	$0, 0, z$	

Symmetry of special projections

Along $[001]$ <i>p</i> 1 $\mathbf{a}' = \frac{1}{3}(2\mathbf{a} + \mathbf{b})$ $\mathbf{b}' = \frac{1}{3}(-\mathbf{a} + \mathbf{b})$ Origin at $0, 0, z$	Along $[100]$ <i>p</i> 1 $\mathbf{a}' = \frac{1}{2}(\mathbf{a} + 2\mathbf{b})$ $\mathbf{b}' = \frac{1}{3}(-\mathbf{a} - 2\mathbf{b} + \mathbf{c})$ Origin at $x, 0, 0$	Along $[210]$ <i>p</i> 1 $\mathbf{a}' = \frac{1}{2}\mathbf{b}$ $\mathbf{b}' = \frac{1}{3}\mathbf{c}$ Origin at $x, \frac{1}{2}x, 0$
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R3

C₃⁴

3

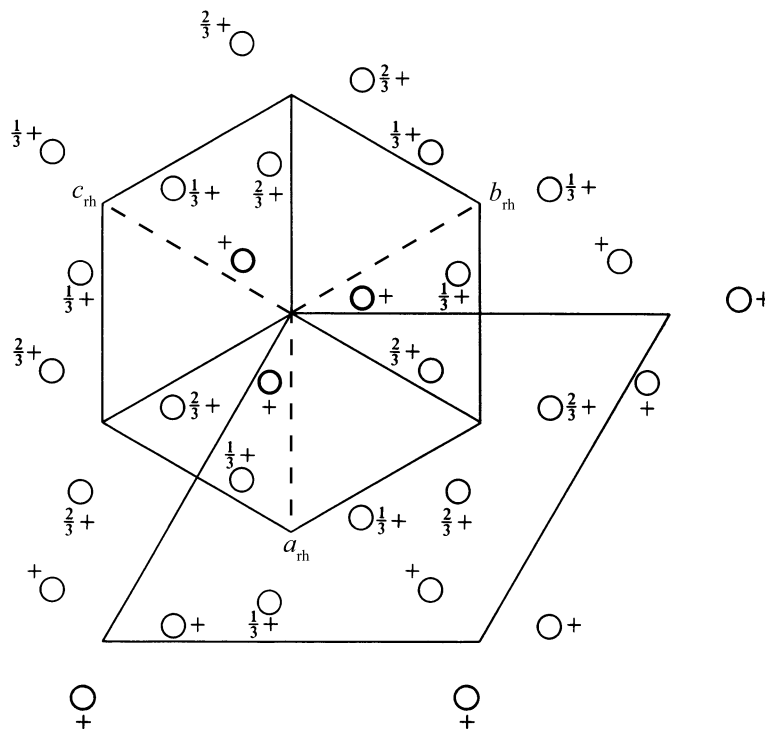
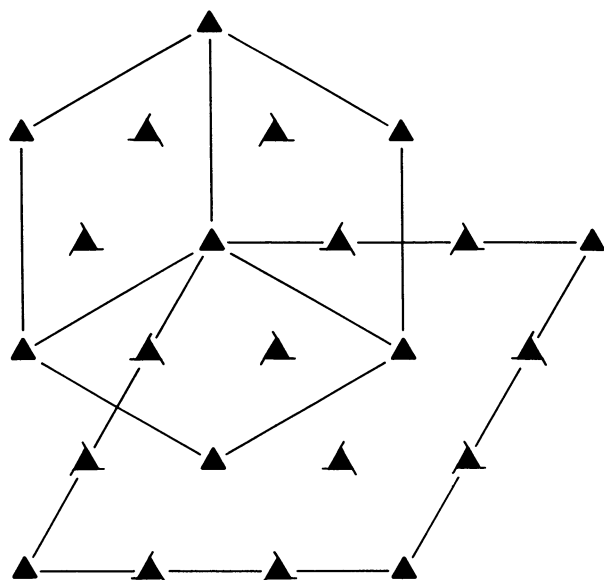
Trigonal

No. 146

R3

Patterson symmetry R $\bar{3}$

RHOMBOHEDRAL AXES



Heights refer to hexagonal axes

Origin on 3

Asymmetric unit $0 \leq x \leq 1; 0 \leq y \leq 1; 0 \leq z \leq 1; z \leq \min(x,y)$
Vertices 0,0,0 1,0,0 1,1,0 0,1,0 1,1,1

Symmetry operations

(1) 1 (2) 3⁺ x,x,x (3) 3⁻ x,x,x

Generators selected (1); t(1,0,0); t(0,1,0); t(0,0,1); (2)

Positions

Multiplicity,
Wyckoff letter,
Site symmetry

Coordinates

Reflection conditions

3	b	1	(1) x,y,z	(2) z,x,y	(3) y,z,x
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General:

no conditions

Special: no extra conditions

1	a	3.	x,x,x
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Symmetry of special projections

Along [111] p3
 $\mathbf{a}' = \frac{1}{3}(2\mathbf{a} - \mathbf{b} - \mathbf{c})$
 Origin at x,x,x

$\mathbf{b}' = \frac{1}{3}(-\mathbf{a} + 2\mathbf{b} - \mathbf{c})$

Along [110] p1
 $\mathbf{a}' = \frac{1}{2}(\mathbf{a} + \mathbf{b} - 2\mathbf{c})$
 Origin at x, \bar{x} , 0

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

Along [211] p1
 $\mathbf{a}' = \frac{1}{2}(\mathbf{b} - \mathbf{c})$
 Origin at 2x, \bar{x} , \bar{x}