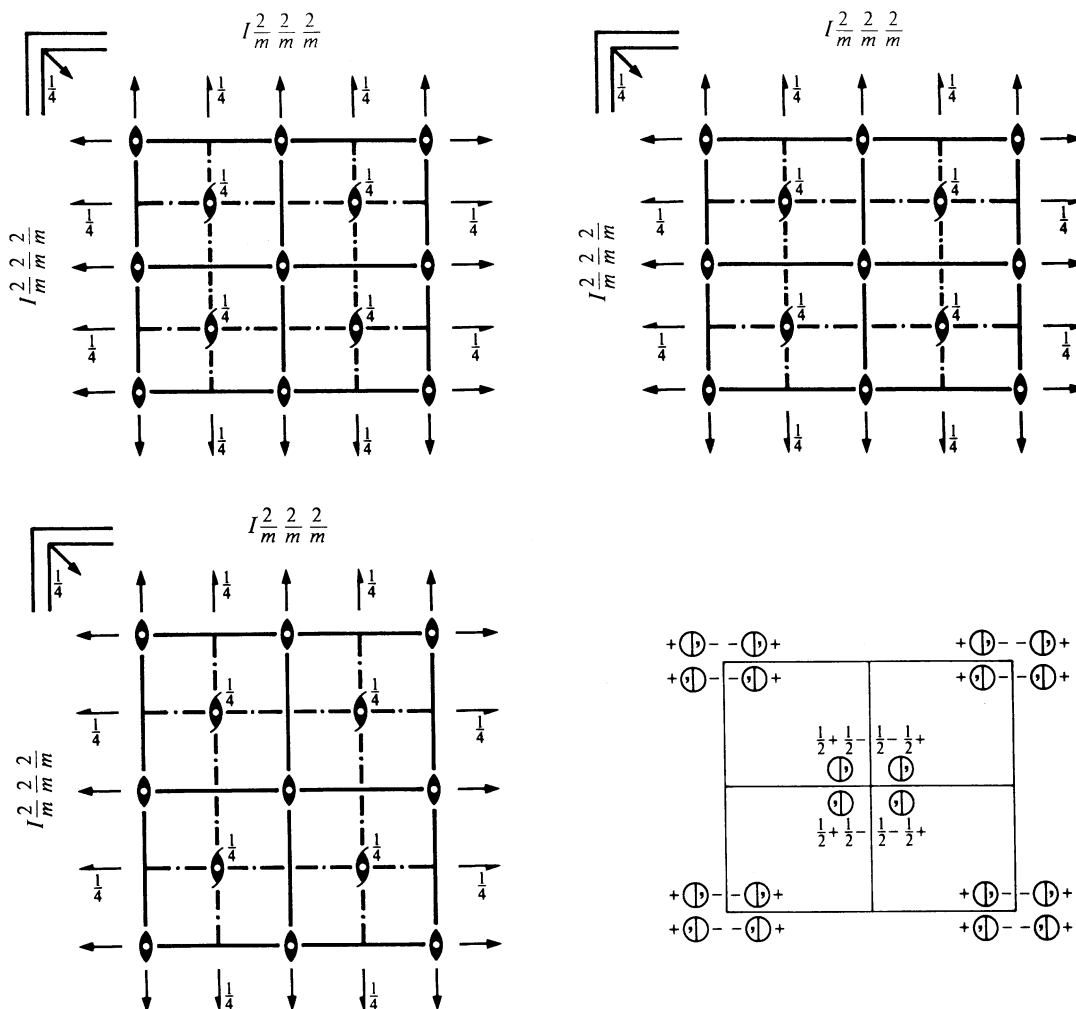


$I m m m$
 D_{2h}^{25}
 $m m m$

Orthorhombic

No. 71

 $I 2/m 2/m 2/m$

 Patterson symmetry $I m m m$

Origin at centre (mmm)

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

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

- | | | | |
|-----------------------|-----------------|-----------------|-----------------|
| (1) 1 | (2) 2 $0,0,z$ | (3) 2 $0,y,0$ | (4) 2 $x,0,0$ |
| (5) $\bar{1}$ $0,0,0$ | (6) m $x,y,0$ | (7) m $x,0,z$ | (8) m $0,y,z$ |

 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) $2(0, \frac{1}{2}, 0)$ $\frac{1}{4}, y, \frac{1}{4}$ | (4) $2(\frac{1}{2}, 0, 0)$ $x, \frac{1}{4}, \frac{1}{4}$ |
| (5) $\bar{1}$ $\frac{1}{4}, \frac{1}{4}, \frac{1}{4}$ | (6) $n(\frac{1}{2}, \frac{1}{2}, 0)$ $x, y, \frac{1}{4}$ | (7) $n(\frac{1}{2}, 0, \frac{1}{2})$ $x, \frac{1}{4}, z$ | (8) $n(0, \frac{1}{2}, \frac{1}{2})$ $\frac{1}{4}, y, z$ |

Maximal isomorphic subgroups of lowest index
IIc [3] $I m m m$ ($\mathbf{a}' = 3\mathbf{a}$ or $\mathbf{b}' = 3\mathbf{b}$ or $\mathbf{c}' = 3\mathbf{c}$) (71)

Minimal non-isomorphic supergroups
I [2] $I 4/m m m$ (139); [3] $I m \bar{3}$ (204)

II [2] $A m m m$ ($\mathbf{a}' = \frac{1}{2}\mathbf{a}$) ($C m m m$, 65); [2] $B m m m$ ($\mathbf{b}' = \frac{1}{2}\mathbf{b}$) ($C m m m$, 65); [2] $C m m m$ ($\mathbf{c}' = \frac{1}{2}\mathbf{c}$) (65)

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				Reflection conditions
		(0,0,0)+	$(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})+$			General:
16	<i>o</i> 1	(1) x, y, z (5) $\bar{x}, \bar{y}, \bar{z}$	(2) \bar{x}, \bar{y}, z (6) x, y, \bar{z}	(3) \bar{x}, y, \bar{z} (7) x, \bar{y}, z	(4) x, \bar{y}, \bar{z} (8) \bar{x}, y, z	$hkl : h + k + l = 2n$ $0kl : k + l = 2n$ $h0l : h + l = 2n$ $hk0 : h + k = 2n$ $h00 : h = 2n$ $0k0 : k = 2n$ $00l : l = 2n$ Special: as above, plus
8	<i>n</i> . . <i>m</i>	$x, y, 0$	$\bar{x}, \bar{y}, 0$	$\bar{x}, y, 0$	$x, \bar{y}, 0$	no extra conditions
8	<i>m</i> . <i>m</i> .	$x, 0, z$	$\bar{x}, 0, z$	$\bar{x}, 0, \bar{z}$	$x, 0, \bar{z}$	no extra conditions
8	<i>l</i> <i>m</i> . .	$0, y, z$	$0, \bar{y}, z$	$0, y, \bar{z}$	$0, \bar{y}, \bar{z}$	no extra conditions
8	<i>k</i> $\bar{1}$	$\frac{1}{4}, \frac{1}{4}, \frac{1}{4}$	$\frac{3}{4}, \frac{3}{4}, \frac{1}{4}$	$\frac{3}{4}, \frac{1}{4}, \frac{3}{4}$	$\frac{1}{4}, \frac{3}{4}, \frac{3}{4}$	$hkl : k, l = 2n$
4	<i>j</i> <i>m m</i> 2	$\frac{1}{2}, 0, z$	$\frac{1}{2}, 0, \bar{z}$			no extra conditions
4	<i>i</i> <i>m m</i> 2	$0, 0, z$	$0, 0, \bar{z}$			no extra conditions
4	<i>h</i> <i>m</i> 2 <i>m</i>	$0, y, \frac{1}{2}$	$0, \bar{y}, \frac{1}{2}$			no extra conditions
4	<i>g</i> <i>m</i> 2 <i>m</i>	$0, y, 0$	$0, \bar{y}, 0$			no extra conditions
4	<i>f</i> 2 <i>m m</i>	$x, \frac{1}{2}, 0$	$\bar{x}, \frac{1}{2}, 0$			no extra conditions
4	<i>e</i> 2 <i>m m</i>	$x, 0, 0$	$\bar{x}, 0, 0$			no extra conditions
2	<i>d</i> <i>m m m</i>	$\frac{1}{2}, 0, \frac{1}{2}$				no extra conditions
2	<i>c</i> <i>m m m</i>	$\frac{1}{2}, \frac{1}{2}, 0$				no extra conditions
2	<i>b</i> <i>m m m</i>	$0, \frac{1}{2}, \frac{1}{2}$				no extra conditions
2	<i>a</i> <i>m m m</i>	$0, 0, 0$				no extra conditions

Symmetry of special projectionsAlong [001] *c* 2*mm* $\mathbf{a}' = \mathbf{a}$ $\mathbf{b}' = \mathbf{b}$ Origin at 0,0,*z*Along [100] *c* 2*mm* $\mathbf{a}' = \mathbf{b}$ $\mathbf{b}' = \mathbf{c}$ Origin at *x*,0,0Along [010] *c* 2*mm* $\mathbf{a}' = \mathbf{c}$ $\mathbf{b}' = \mathbf{a}$ Origin at 0,*y*,0**Maximal non-isomorphic subgroups**

I	[2] <i>Imm</i> 2 (44)	(1; 2; 7; 8)+	IIa	[2] <i>Pmnn</i> (59)	1; 2; 7; 8; (3; 4; 5; 6) + $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$
	[2] <i>Im</i> 2 <i>m</i> (<i>Imm</i> 2, 44)	(1; 3; 6; 8)+		[2] <i>Pmnm</i> (<i>Pmnn</i> , 59)	1; 3; 6; 8; (2; 4; 5; 7) + $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$
	[2] <i>I</i> 2 <i>mm</i> (<i>Imm</i> 2, 44)	(1; 4; 6; 7)+		[2] <i>Pnmm</i> (<i>Pmnn</i> , 59)	1; 4; 6; 7; (2; 3; 5; 8) + $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$
	[2] <i>I</i> 222 (23)	(1; 2; 3; 4)+		[2] <i>Pnmm</i> (58)	1; 2; 5; 6; (3; 4; 7; 8) + $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$
	[2] <i>I</i> 112/ <i>m</i> (<i>C</i> 2/ <i>m</i> , 12)	(1; 2; 5; 6)+		[2] <i>Pnmm</i> (<i>Pnmm</i> , 58)	1; 3; 5; 7; (2; 4; 6; 8) + $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$
	[2] <i>I</i> 12/ <i>m</i> 1 (<i>C</i> 2/ <i>m</i> , 12)	(1; 3; 5; 7)+		[2] <i>Pmnn</i> (<i>Pnmm</i> , 58)	1; 4; 5; 8; (2; 3; 6; 7) + $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$
	[2] <i>I</i> 2/ <i>m</i> 11 (<i>C</i> 2/ <i>m</i> , 12)	(1; 4; 5; 8)+		[2] <i>Pnnn</i> (48)	1; 2; 3; 4; (5; 6; 7; 8) + $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$
				[2] <i>Pmmm</i> (47)	1; 2; 3; 4; 5; 6; 7; 8
			IIb	none	

(Continued on preceding page)