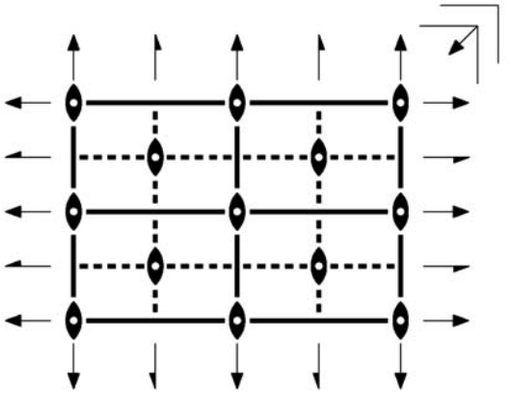
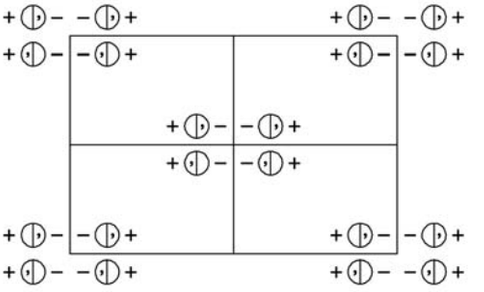
cmmm *mmm* Orthorhombic/Rectangular

No. 47 $c2/m2/m2/m$ Patterson symmetry *cmmm*





Origin at centre (mmm)

Asymmetric unit $0 \le x \le \frac{1}{4}; \quad 0 \le y \le \frac{1}{2}; \quad 0 \le z$

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

(1) $t(\frac{1}{2},\frac{1}{2},0)$	(2) 2 $\frac{1}{4},\frac{1}{4},z$	(3) $2(0,\frac{1}{2},0)$ $\frac{1}{4},y,0$	(4) $2(\frac{1}{2},0,0)$ $x,\frac{1}{4},0$
(5) $\bar{1}$ $\frac{1}{4},\frac{1}{4},0$	(6) $n(\frac{1}{2},\frac{1}{2},0)$ $x,y,0$	(7) a $x,\frac{1}{4},z$	(8) b $\frac{1}{4},y,z$

Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(\frac{1}{2},\frac{1}{2},0)$; (2); (3); (5)

Positions

Multiplicity, Wyckoff letter, Site symmetry			Coordinates				Reflection conditions
			$(0,0,0)+$	$(\frac{1}{2},\frac{1}{2},0)+$			General:
16	l	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) $\bar{x},y,z$	hk: $h+k=2n$ $h0$: $h=2n$ $0k$: $k=2n$
							Special: as above, plus
8	k	$..m$	$x,y,0$	$\bar{x},\bar{y},0$	$\bar{x},y,0$	$x,\bar{y},0$	no extra conditions
8	j	$.m.$	$x,0,z$	$\bar{x},0,z$	$\bar{x},0,\bar{z}$	$x,0,\bar{z}$	no extra conditions
8	i	$m..$	$0,y,z$	$0,\bar{y},z$	$0,y,\bar{z}$	$0,\bar{y},\bar{z}$	no extra conditions
8	h	$..2$	$\frac{1}{4},\frac{1}{4},z$	$\frac{3}{4},\frac{1}{4},\bar{z}$	$\frac{3}{4},\frac{3}{4},\bar{z}$	$\frac{1}{4},\frac{3}{4},z$	hk: $h=2n$
4	g	$m\,m\,2$	$0,\frac{1}{2},z$	$0,\frac{1}{2},\bar{z}$			no extra conditions
4	f	$m\,m\,2$	$0,0,z$	$0,0,\bar{z}$			no extra conditions
4	e	$m\,2\,m$	$0,y,0$	$0,\bar{y},0$			no extra conditions
4	d	$2\,m\,m$	$x,0,0$	$\bar{x},0,0$			no extra conditions
4	c	$..2/m$	$\frac{1}{4},\frac{1}{4},0$	$\frac{3}{4},\frac{1}{4},0$			hk: $h=2n$
2	b	$m\,m\,m$	$\frac{1}{2},0,0$				no extra conditions
2	a	$m\,m\,m$	$0,0,0$				no extra conditions

Symmetry of special projections

Along [001] $c2mm$
$\mathbf{a}' = \mathbf{a}$ $\mathbf{b}' = \mathbf{b}$
Origin at $0,0,z$

Along [100] $\not{c}2mm$
$\mathbf{a}' = \frac{1}{2}\mathbf{b}$
Origin at $x,0,0$

Along [010] $\not{c}2mm$
$\mathbf{a}' = \frac{1}{2}\mathbf{a}$
Origin at $0,y,0$

Maximal non-isotypic subgroups

I	[2] $cm2m$ (35)	(1; 3; 6; 8)+
	[2] $c2mm$ ($cm2m$, 35)	(1; 4; 6; 7)+
	[2] $cmm2$ (26)	(1; 2; 7; 8)+
	[2] $c222$ (22)	(1; 2; 3; 4)+
	[2] $c12/m1$ ($c2/m11$, 18)	(1; 3; 5; 7)+
	[2] $c2/m11$ (18)	(1; 4; 5; 8)+
	[2] $c112/m$ ($p112/m$, 6)	(1; 2; 5; 6)+
IIa	[2] $pmmn$ (46)	1; 2; 7; 8; (3; 4; 5; 6) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $pbam$ (44)	1; 2; 5; 6; (3; 4; 7; 8) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $pbmn$ ($pman$, 42)	1; 3; 5; 7; (2; 4; 6; 8) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $pman$ (42)	1; 4; 5; 8; (2; 3; 6; 7) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $pmam$ (40)	1; 3; 6; 8; (2; 4; 5; 7) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $pbmm$ ($pmam$, 40)	1; 4; 6; 7; (2; 3; 5; 8) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $pban$ (39)	1; 2; 3; 4; (5; 6; 7; 8) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $pmmm$ (37)	1; 2; 3; 4; 5; 6; 7; 8
IIb	none	

Maximal isotypic subgroups of lowest index

IIc [3] $cmmm$ ($\mathbf{a}' = 3\mathbf{a}$ or $\mathbf{b}' = 3\mathbf{b}$) (47)

Minimal non-isotypic supergroups

I [2] $p4/mmm$ (61); [2] $p4/mbm$ (63); [3] $p6/mmm$ (80)

II [2] $pmmm$ ($\mathbf{a}' = \frac{1}{2}\mathbf{a}, \mathbf{b}' = \frac{1}{2}\mathbf{b}$) (37)