$Cmm2$ International symbol and number

No. 35

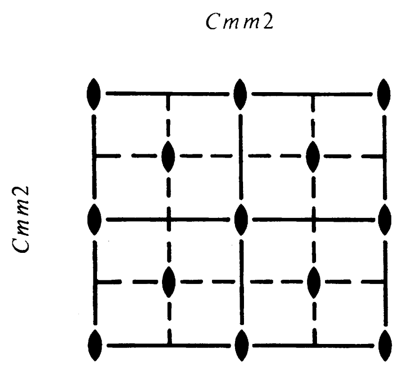
C_{2v}^{11} Schoenflies notation

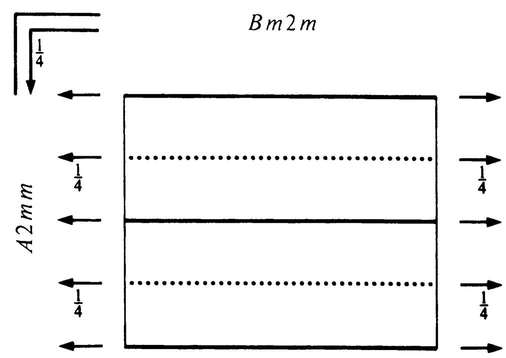
$Cmm2$

$mm2$ Point Group

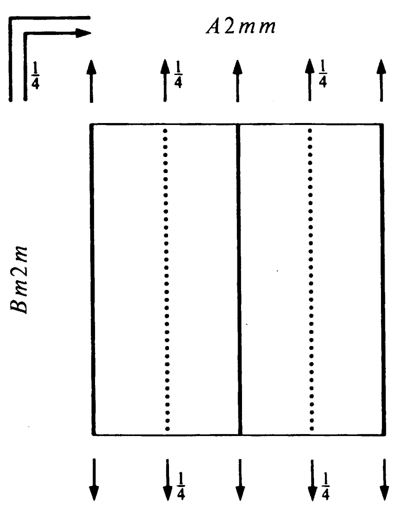
Orthorhombic

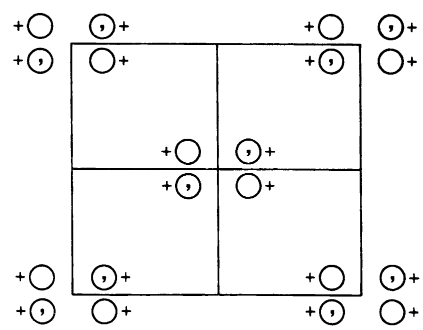
Patterson symmetry $Cmmm$





Symmetry elements along three main directions of crystal reference frame





Drawing of Equivalent positions

Origin on $mm2$

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

Smallest part of space from which the whole space can be filled exactly by application of all symmetry operations

Symmetry operations

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

(1) 1 (2) $2 \quad 0,0,z$ (3) $m \quad x,0,z$ (4) $m \quad 0,y,z$

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

(1) $t(\frac{1}{2},\frac{1}{2},0)$ (2) $2 \quad \frac{1}{4},\frac{1}{4},z$ (3) $a \quad x,\frac{1}{4},z$ (4) $b \quad \frac{1}{4},y,z$

All 8 symmetry operations are listed. Note that the operations are given for each

A selection of the symmetry operations and translation vectors which can generate all operations.

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

Positions

Multiplicity, Wyckoff letter, Site symmetry			Coordinates $(0,0,0)+ \quad (\frac{1}{2},\frac{1}{2},0)+$				Reflection conditions
							General:
8	f	1	(1) x,y,z	(2) $\bar{x},\bar{y},z$	(3) $x,\bar{y},z$	(4) $\bar{x},y,z$	$hkl: h+k=2n$ $0kl: k=2n$ $h0l: h=2n$ $hk0: h+k=2n$ $h00: h=2n$ $0k0: k=2n$
							Special: as above, plus
4	e	$m\,.\,.$	$0,y,z$	$0,\bar{y},z$			no extra conditions
4	d	$.\,m\,.$	$x,0,z$	$\bar{x},0,z$			no extra conditions
4	c	$.\,.\,2$	$\frac{1}{4},\frac{1}{4},z$	$\frac{1}{4},\frac{3}{4},z$			$hkl: h=2n$
2	b	$m\,m\,2$	$0,\frac{1}{2},z$				no extra conditions
2	a	$m\,m\,2$	$0,0,z$				no extra conditions

General position

Special positions

Plane group symmetry when projected along special directions

Symmetry of special projections

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

Along [100] $p1m1$
$\mathbf{a}'=\frac{1}{2}\mathbf{b}$ $\quad \mathbf{b}'=\mathbf{c}$
Origin at $x,0,0$

Along [010] $p11m$
$\mathbf{a}'=\mathbf{c}$ $\quad \mathbf{b}'=\frac{1}{2}\mathbf{a}$
Origin at $0,y,0$

Maximal non-isomorphic subgroups

I	[2] $C1m1$ (Cm, 8)	(1; 3)+
	[2] $Cm11$ (Cm, 8)	(1; 4)+
	[2] $C112$ ($P2$, 3)	(1; 2)+
IIa	[2] $Pba2$ (32)	1; 2; (3; 4) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $Pbm2$ ($Pma2$, 28)	1; 3; (2; 4) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $Pma2$ (28)	1; 4; (2; 3) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $Pmm2$ (25)	1; 2; 3; 4

IIb [2] $Ima2$ ($\mathbf{c}'=2\mathbf{c}$) (46); [2] $Ibm2$ ($\mathbf{c}'=2\mathbf{c}$) ($Ima2$, 46); [2] $Iba2$ ($\mathbf{c}'=2\mathbf{c}$) (45); [2] $Imm2$ ($\mathbf{c}'=2\mathbf{c}$) (44); [2] $Ccc2$ ($\mathbf{c}'=2\mathbf{c}$) (37); [2] $Cmc2_1$ ($\mathbf{c}'=2\mathbf{c}$) (36); [2] $Ccm2_1$ ($\mathbf{c}'=2\mathbf{c}$) ($Cmc2_1$, 36)

Maximal isomorphic subgroups of lowest index

IIc [2] $Cmm2$ ($\mathbf{c}'=2\mathbf{c}$) (35); [3] $Cmm2$ ($\mathbf{a}'=3\mathbf{a}$ or $\mathbf{b}'=3\mathbf{b}$) (35)

Minimal non-isomorphic supergroups

I [2] $Cmmm$ (65); [2] $Cmme$ (67); [2] $P4mm$ (99); [2] $P4bm$ (100); [2] $P4_2cm$ (101); [2] $P4_2nm$ (102); [2] $P\bar{4}2m$ (111); [2] $P\bar{4}2_1m$ (113); [3] $P6mm$ (183)

II [2] $Fmm2$ (42); [2] $Pmm2$ ($\mathbf{a}'=\frac{1}{2}\mathbf{a},\mathbf{b}'=\frac{1}{2}\mathbf{b}$) (25)