

$Ccc2$

No. 37

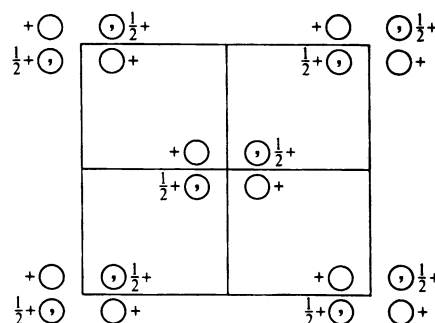
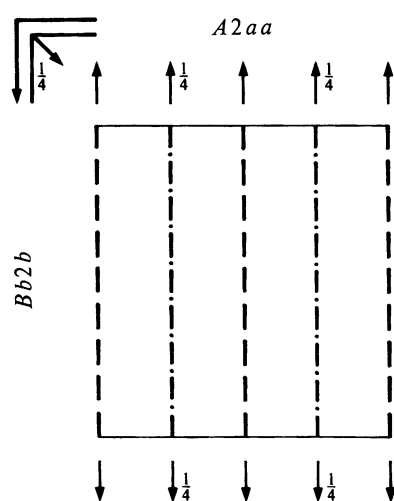
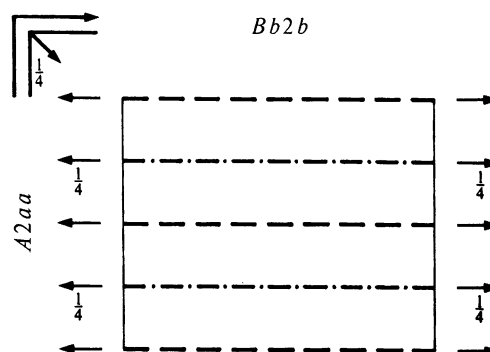
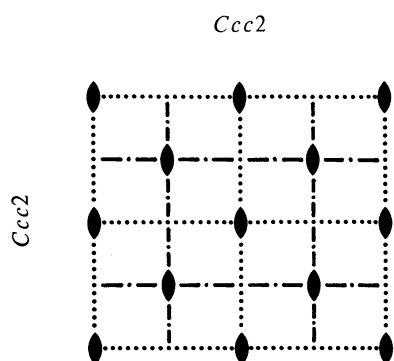
$C_{2v}^{13}$

$Ccc2$

$mm2$

Orthorhombic

Patterson symmetry  $Cmmm$



Origin on  $cc2$

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

Symmetry operations

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

- (1) 1 (2)  $2 \ 0,0,z$  (3)  $c \ x,0,z$  (4)  $c \ 0,y,z$

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)  $n(\frac{1}{2},0,\frac{1}{2}) \ x,\frac{1}{4},z$  (4)  $n(0,\frac{1}{2},\frac{1}{2}) \ \frac{1}{4},y,z$

**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				Reflection conditions
	(0,0,0)+ $(\frac{1}{2},\frac{1}{2},0)$ +				General:
8 <i>d</i> 1	(1) $x,y,z$	(2) $\bar{x},\bar{y},z$	(3) $x,\bar{y},z+\frac{1}{2}$	(4) $\bar{x},y,z+\frac{1}{2}$	$hkl : h+k=2n$ $0kl : k,l=2n$ $h0l : h,l=2n$ $hk0 : h+k=2n$ $h00 : h=2n$ $0k0 : k=2n$ $00l : l=2n$
4 <i>c</i> ..2	$\frac{1}{4},\frac{1}{4},z$	$\frac{1}{4},\frac{3}{4},z+\frac{1}{2}$			$hkl : k+l=2n$
4 <i>b</i> ..2	$0,\frac{1}{2},z$	$0,\frac{1}{2},z+\frac{1}{2}$			$hkl : l=2n$
4 <i>a</i> ..2	$0,0,z$	$0,0,z+\frac{1}{2}$			$hkl : l=2n$

**Symmetry of special projections**

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

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

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

**Maximal non-isomorphic subgroups**

<b>I</b>	[2] $C1c1$ ( $Cc$ , 9)	(1; 3)+
	[2] $Cc11$ ( $Cc$ , 9)	(1; 4)+
	[2] $C112$ ( $P2$ , 3)	(1; 2)+
<b>IIa</b>	[2] $Pnn2$ (34)	1; 2; (3; 4) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $Pnc2$ (30)	1; 3; (2; 4) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $Pcn2$ ( $Pnc2$ , 30)	1; 4; (2; 3) + $(\frac{1}{2},\frac{1}{2},0)$
	[2] $Pcc2$ (27)	1; 2; 3; 4
<b>IIIb</b>	none	

**Maximal isomorphic subgroups of lowest index**

**IIIc** [3]  $Ccc2$  ( $\mathbf{a}' = 3\mathbf{a}$  or  $\mathbf{b}' = 3\mathbf{b}$ ) (37); [3]  $Ccc2$  ( $\mathbf{c}' = 3\mathbf{c}$ ) (37)

**Minimal non-isomorphic supergroups**

<b>I</b>	[2] $Cccm$ (66); [2] $Ccce$ (68); [2] $P4cc$ (103); [2] $P4nc$ (104); [2] $P4_2mc$ (105); [2] $P4_2bc$ (106); [2] $P\bar{4}2c$ (112); [2] $P\bar{4}2_1c$ (114); [3] $P6cc$ (184)
<b>II</b>	[2] $Fmm2$ (42); [2] $Pcc2$ ( $\mathbf{a}' = \frac{1}{2}\mathbf{a}$ , $\mathbf{b}' = \frac{1}{2}\mathbf{b}$ ) (27); [2] $Cmm2$ ( $\mathbf{c}' = \frac{1}{2}\mathbf{c}$ ) (35)