

$Cmmm$

No. 65

 $C2/m2/m2/m$ D_{2h}^{19} 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); (5)

General position

Multiplicity,
Wyckoff letter,
Site symmetry

Coordinates

 $(0,0,0)+$ $(\frac{1}{2},\frac{1}{2},0)+$ 16 r 1(1) x, y, z (2) \bar{x}, \bar{y}, z (3) \bar{x}, y, \bar{z} (4) x, \bar{y}, \bar{z}
(5) $\bar{x}, \bar{y}, \bar{z}$ (6) x, y, \bar{z} (7) x, \bar{y}, z (8) \bar{x}, y, z

I Maximal translationengleiche subgroups

[2] $Cm2m$ (38, $Amm2$)	(1; 3; 6; 8)+	c, a, b
[2] $C2mm$ (38, $Amm2$)	(1; 4; 6; 7)+	c, b, -a
[2] $Cmm2$ (35)	(1; 2; 7; 8)+	
[2] $C222$ (21)	(1; 2; 3; 4)+	
[2] $C12/m1$ (12)	(1; 3; 5; 7)+	
[2] $C2/m11$ (12, $C12/m1$)	(1; 4; 5; 8)+	-b, a, c
[2] $C112/m$ (10, $P112/m$)	(1; 2; 5; 6)+	$1/2(\mathbf{a}-\mathbf{b}), 1/2(\mathbf{a}+\mathbf{b}), \mathbf{c}$

II Maximal klassengleiche subgroups

• Loss of centring translations

[2] $Pmmm$ (59)	1; 2; 7; 8; (3; 4; 5; 6) + $(\frac{1}{2}, \frac{1}{2}, 0)$	$1/4, 1/4, 0$
[2] $Pbam$ (55)	1; 2; 5; 6; (3; 4; 7; 8) + $(\frac{1}{2}, \frac{1}{2}, 0)$	
[2] $Pbmn$ (53, $Pmna$)	1; 3; 5; 7; (2; 4; 6; 8) + $(\frac{1}{2}, \frac{1}{2}, 0)$	b, c, a
[2] $Pman$ (53, $Pmna$)	1; 4; 5; 8; (2; 3; 6; 7) + $(\frac{1}{2}, \frac{1}{2}, 0)$	a, -c, b
[2] $Pmam$ (51, $Pmma$)	1; 3; 6; 8; (2; 4; 5; 7) + $(\frac{1}{2}, \frac{1}{2}, 0)$	a, -c, b
[2] $Pbmm$ (51, $Pmma$)	1; 4; 6; 7; (2; 3; 5; 8) + $(\frac{1}{2}, \frac{1}{2}, 0)$	b, c, a
[2] $Pban$ (50)	1; 2; 3; 4; (5; 6; 7; 8) + $(\frac{1}{2}, \frac{1}{2}, 0)$	$1/4, 1/4, 0$
[2] $Pmmm$ (47)	1; 2; 3; 4; 5; 6; 7; 8	$1/4, 1/4, 0$

• Enlarged unit cell

[2] $\mathbf{c}' = 2\mathbf{c}$		
$Ibmm$ (74, $Imma$)	$\langle 3; 5; 2 + (0,0,1) \rangle$	b, 2c, a
$Ibmm$ (74, $Imma$)	$\langle (2; 3; 5) + (0,0,1) \rangle$	b, 2c, a
$Imam$ (74, $Imma$)	$\langle 5; (2; 3) + (0,0,1) \rangle$	a, -2c, b
$Imam$ (74, $Imma$)	$\langle 3; (2; 5) + (0,0,1) \rangle$	a, -2c, b
$Ibam$ (72)	$\langle 2; 5; 3 + (0,0,1) \rangle$	a, b, 2c
$Ibam$ (72)	$\langle 2; 3; 5 + (0,0,1) \rangle$	a, b, 2c
$Immm$ (71)	$\langle 2; 3; 5 \rangle$	a, b, 2c
$Immm$ (71)	$\langle 2; (3; 5) + (0,0,1) \rangle$	a, b, 2c
$Cccm$ (66)	$\langle 2; 5; 3 + (0,0,1) \rangle$	a, b, 2c
$Cccm$ (66)	$\langle 2; 3; 5 + (0,0,1) \rangle$	a, b, 2c
$Cmmm$ (65)	$\langle 2; 3; 5 \rangle$	a, b, 2c
$Cmmm$ (65)	$\langle 2; (3; 5) + (0,0,1) \rangle$	a, b, 2c
$Ccmm$ (63, $Cmcm$)	$\langle 3; 5; 2 + (0,0,1) \rangle$	-b, a, 2c
$Ccmm$ (63, $Cmcm$)	$\langle (2; 3; 5) + (0,0,1) \rangle$	-b, a, 2c
$Cmcm$ (63)	$\langle 5; (2; 3) + (0,0,1) \rangle$	a, b, 2c
$Cmcm$ (63)	$\langle 3; (2; 5) + (0,0,1) \rangle$	a, b, 2c
[3] $\mathbf{a}' = 3\mathbf{a}$		
$Cmmm$ (65)	$\langle 2; 3; 5 \rangle$	3a, b, c
$Cmmm$ (65)	$\langle (2; 3; 5) + (2,0,0) \rangle$	3a, b, c
$Cmmm$ (65)	$\langle (2; 3; 5) + (4,0,0) \rangle$	3a, b, c
[3] $\mathbf{b}' = 3\mathbf{b}$		
$Cmmm$ (65)	$\langle 2; 3; 5 \rangle$	a, 3b, c
$Cmmm$ (65)	$\langle 3; (2; 5) + (0,2,0) \rangle$	a, 3b, c
$Cmmm$ (65)	$\langle 3; (2; 5) + (0,4,0) \rangle$	a, 3b, c
[3] $\mathbf{c}' = 3\mathbf{c}$		
$Cmmm$ (65)	$\langle 2; 3; 5 \rangle$	a, b, 3c
$Cmmm$ (65)	$\langle 2; (3; 5) + (0,0,2) \rangle$	a, b, 3c
$Cmmm$ (65)	$\langle 2; (3; 5) + (0,0,4) \rangle$	a, b, 3c

- **Series of maximal isomorphic subgroups**

[p] $\mathbf{a}' = p\mathbf{a}$ <i>Cmmm</i> (65)	$\langle (2; 3; 5) + (2u, 0, 0) \rangle$ $p > 2; 0 \leq u < p$ p conjugate subgroups for the prime p	$p\mathbf{a}, \mathbf{b}, \mathbf{c}$	$u, 0, 0$
[p] $\mathbf{b}' = p\mathbf{b}$ <i>Cmmm</i> (65)	$\langle 3; (2; 5) + (0, 2u, 0) \rangle$ $p > 2; 0 \leq u < p$ p conjugate subgroups for the prime p	$\mathbf{a}, p\mathbf{b}, \mathbf{c}$	$0, u, 0$
[p] $\mathbf{c}' = p\mathbf{c}$ <i>Cmmm</i> (65)	$\langle 2; (3; 5) + (0, 0, 2u) \rangle$ $p > 2; 0 \leq u < p$ p conjugate subgroups for the prime p	$\mathbf{a}, \mathbf{b}, p\mathbf{c}$	$0, 0, u$

I Minimal translationengleiche supergroups

[2] $P4/mmm$ (123); [2] $P4/mbm$ (127); [2] $P4_2/mcm$ (132); [2] $P4_2/mnm$ (136); [3] $P6/mmm$ (191)

II Minimal non-isomorphic klassengleiche supergroups

- **Additional centring translations**

[2] $Fmmm$ (69)

- **Decreased unit cell**

[2] $\mathbf{a}' = \frac{1}{2}\mathbf{a}, \mathbf{b}' = \frac{1}{2}\mathbf{b}$ $Pmmm$ (47)

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I Minimal translationengleiche supergroups

[2] $P4/mcc$ (124); [2] $P4/mnc$ (128); [2] $P4_2/mmc$ (131); [2] $P4_2/mbc$ (135); [3] $P6/mcc$ (192)

II Minimal non-isomorphic klassengleiche supergroups

- **Additional centring translations**

[2] $Fmmm$ (69)

- **Decreased unit cell**

[2] $\mathbf{a}' = \frac{1}{2}\mathbf{a}, \mathbf{b}' = \frac{1}{2}\mathbf{b}$ $Pccm$ (49); [2] $\mathbf{c}' = \frac{1}{2}\mathbf{c}$ $Cmmm$ (65)