

$C_{2v}^{18}$ 
 $Fmm2$ 

No. 42

 $Fmm2$ 
**Generators selected** (1);  $t(1,0,0)$ ;  $t(0,1,0)$ ;  $t(0,0,1)$ ;  $t(0, \frac{1}{2}, \frac{1}{2})$ ;  $t(\frac{1}{2}, 0, \frac{1}{2})$ ; (2); (3)

**General position**

Multiplicity,

Wyckoff letter,

Site symmetry

Coordinates

 16  $e$  1

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

 (1)  $x, y, z$  (2)  $\bar{x}, \bar{y}, z$  (3)  $x, \bar{y}, z$  (4)  $\bar{x}, y, z$ 
**I Maximal translationengleiche subgroups**

[2] $F1m1$ (8, $C1m1$ )	(1; 3)+	$\mathbf{a, b, 1/2(-a+c)}$
[2] $Fm11$ (8, $C1m1$ )	(1; 4)+	$\mathbf{c, a, 1/2(b-c)}$
[2] $F112$ (5, $A112$ )	(1; 2)+	$\mathbf{1/2(a-b), b, c}$

**II Maximal klassengleiche subgroups**
**• Loss of centring translations**

[2] $Aea2$ (41)	1; 2; (1; 2) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (3; 4) + $(\frac{1}{2}, 0, \frac{1}{2})$ ; (3; 4) + $(\frac{1}{2}, \frac{1}{2}, 0)$		
[2] $Bbe2$ (41, $Aea2$ )	1; 2; (1; 2) + $(\frac{1}{2}, 0, \frac{1}{2})$ ; (3; 4) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (3; 4) + $(\frac{1}{2}, \frac{1}{2}, 0)$	$-\mathbf{b, a, c}$	
[2] $Ama2$ (40)	1; 4; (1; 4) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (2; 3) + $(\frac{1}{2}, 0, \frac{1}{2})$ ; (2; 3) + $(\frac{1}{2}, \frac{1}{2}, 0)$		$1/4, 1/4, 0$
[2] $Bbm2$ (40, $Ama2$ )	1; 3; (1; 3) + $(\frac{1}{2}, 0, \frac{1}{2})$ ; (2; 4) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (2; 4) + $(\frac{1}{2}, \frac{1}{2}, 0)$	$-\mathbf{b, a, c}$	$1/4, 1/4, 0$
[2] $Bme2$ (39, $Aem2$ )	1; 4; (1; 4) + $(\frac{1}{2}, 0, \frac{1}{2})$ ; (2; 3) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (2; 3) + $(\frac{1}{2}, \frac{1}{2}, 0)$	$-\mathbf{b, a, c}$	$1/4, 1/4, 0$
[2] $Aem2$ (39)	1; 3; (1; 3) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (2; 4) + $(\frac{1}{2}, 0, \frac{1}{2})$ ; (2; 4) + $(\frac{1}{2}, \frac{1}{2}, 0)$		$1/4, 1/4, 0$
[2] $Amm2$ (38)	1; 2; 3; 4; (1; 2; 3; 4) + $(0, \frac{1}{2}, \frac{1}{2})$		
[2] $Bmm2$ (38, $Amm2$ )	1; 2; 3; 4; (1; 2; 3; 4) + $(\frac{1}{2}, 0, \frac{1}{2})$	$-\mathbf{b, a, c}$	
[2] $Ccc2$ (37)	1; 2; (1; 2) + $(\frac{1}{2}, \frac{1}{2}, 0)$ ; (3; 4) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (3; 4) + $(\frac{1}{2}, 0, \frac{1}{2})$		$1/4, 1/4, 0$
[2] $Ccm2_1$ (36, $Cmc2_1$ )	1; 3; (1; 3) + $(\frac{1}{2}, \frac{1}{2}, 0)$ ; (2; 4) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (2; 4) + $(\frac{1}{2}, 0, \frac{1}{2})$	$-\mathbf{b, a, c}$	$1/4, 0, 0$
[2] $Cmc2_1$ (36)	1; 4; (1; 4) + $(\frac{1}{2}, \frac{1}{2}, 0)$ ; (2; 3) + $(0, \frac{1}{2}, \frac{1}{2})$ ; (2; 3) + $(\frac{1}{2}, 0, \frac{1}{2})$		$0, 1/4, 0$
[2] $Cmm2$ (35)	1; 2; 3; 4; (1; 2; 3; 4) + $(\frac{1}{2}, \frac{1}{2}, 0)$		

**• Enlarged unit cell**

[3] $\mathbf{a}' = 3\mathbf{a}$			
$\left\{ \begin{array}{l} Fmm2 (42) \\ Fmm2 (42) \\ Fmm2 (42) \end{array} \right.$	$\langle 2; 3 \rangle$ $\langle 3; 2 + (2, 0, 0) \rangle$ $\langle 3; 2 + (4, 0, 0) \rangle$	$3\mathbf{a, b, c}$ $3\mathbf{a, b, c}$ $3\mathbf{a, b, c}$	$1, 0, 0$ $2, 0, 0$
[3] $\mathbf{b}' = 3\mathbf{b}$			
$\left\{ \begin{array}{l} Fmm2 (42) \\ Fmm2 (42) \\ Fmm2 (42) \end{array} \right.$	$\langle 2; 3 \rangle$ $\langle (2; 3) + (0, 2, 0) \rangle$ $\langle (2; 3) + (0, 4, 0) \rangle$	$\mathbf{a, 3b, c}$ $\mathbf{a, 3b, c}$ $\mathbf{a, 3b, c}$	$0, 1, 0$ $0, 2, 0$
[3] $\mathbf{c}' = 3\mathbf{c}$			
$Fmm2 (42)$	$\langle 2; 3 \rangle$	$\mathbf{a, b, 3c}$	

**• Series of maximal isomorphic subgroups**

[ $p$ ] $\mathbf{a}' = p\mathbf{a}$			
$Fmm2 (42)$	$\langle 3; 2 + (2u, 0, 0) \rangle$ $p > 2; 0 \leq u < p$ $p$ conjugate subgroups for the prime $p$	$p\mathbf{a, b, c}$	$u, 0, 0$
[ $p$ ] $\mathbf{b}' = p\mathbf{b}$			
$Fmm2 (42)$	$\langle (2; 3) + (0, 2u, 0) \rangle$ $p > 2; 0 \leq u < p$ $p$ conjugate subgroups for the prime $p$	$\mathbf{a, pb, c}$	$0, u, 0$
[ $p$ ] $\mathbf{c}' = p\mathbf{c}$			
$Fmm2 (42)$	$\langle 2; 3 \rangle$ $p > 2$ no conjugate subgroups	$\mathbf{a, b, pc}$	

**I Minimal translationengleiche supergroups**

[2]  $Fmmm$  (69); [2]  $I4mm$  (107); [2]  $I4cm$  (108); [2]  $I\bar{4}2m$  (121)

**II Minimal non-isomorphic klassengleiche supergroups**

- Additional centring translations

none

- Decreased unit cell

[2]  $\mathbf{a}' = \frac{1}{2}\mathbf{a}$ ,  $\mathbf{b}' = \frac{1}{2}\mathbf{b}$ ,  $\mathbf{c}' = \frac{1}{2}\mathbf{c}$   $Pmm2$  (25)