

D_4^5 $P4_222$

No. 93

 $P4_222$ Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; (2); (3); (5)

General position

Multiplicity,
Wyckoff letter,
Site symmetry

Coordinates

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

I Maximal *translationengleiche* subgroups

[2] $P4_211$ (77, $P4_2$)	1; 2; 3; 4		
[2] $P212$ (21, $C222$)	1; 2; 7; 8	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	0, 0, 1/4
[2] $P221$ (16, $P222$)	1; 2; 5; 6		

II Maximal *klassengleiche* subgroups

• Enlarged unit cell

[2] $\mathbf{c}' = 2\mathbf{c}$			
$P4_322$ (95)	$\langle 5; (2; 3) + (0, 0, 1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	
$P4_322$ (95)	$\langle (2; 3; 5) + (0, 0, 1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
$P4_122$ (91)	$\langle 3; 5; 2 + (0, 0, 1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	
$P4_122$ (91)	$\langle 3; (2; 5) + (0, 0, 1) \rangle$	$\mathbf{a}, \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
[2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}$			
$C4_222_1$ (94, $P4_22_12$)	$\langle 2; 5; 3 + (1, 0, 0) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	
$C4_222_1$ (94, $P4_22_12$)	$\langle 2; 3; 5 + (1, 0, 0) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	1/2, 1/2, 0
$C4_222$ (93, $P4_222$)	$\langle 2; 3; 5 + (0, 0, 1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	0, 0, 1/4
$C4_222$ (93, $P4_222$)	$\langle 2 + (1, 1, 0); 3 + (1, 0, 0); 5 + (1, 0, 1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	1/2, 1/2, 1/4
[2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}, \mathbf{c}' = 2\mathbf{c}$			
$F4_122$ (98, $I4_122$)	$\langle 3; 5; 2 + (0, 0, 1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	0, 1/2, 0
$F4_122$ (98, $I4_122$)	$\langle 3; (2; 5) + (0, 0, 1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	0, 1/2, 1/2
$F4_122$ (98, $I4_122$)	$\langle (2; 3; 5) + (1, 0, 0) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	1/2, 0, 0
$F4_122$ (98, $I4_122$)	$\langle (2; 3) + (1, 0, 0); 5 + (1, 0, 1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	1/2, 0, 1/2
[3] $\mathbf{c}' = 3\mathbf{c}$			
$P4_222$ (93)	$\langle 2; 5; 3 + (0, 0, 1) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	
$P4_222$ (93)	$\langle 2; 3 + (0, 0, 1); 5 + (0, 0, 2) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	0, 0, 1
$P4_222$ (93)	$\langle 2; 3 + (0, 0, 1); 5 + (0, 0, 4) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	0, 0, 2

• Series of maximal isomorphic subgroups

[p] $\mathbf{c}' = p\mathbf{c}$			
$P4_222$ (93)	$\langle 2; 3 + (0, 0, \frac{p}{2} - \frac{1}{2}); 5 + (0, 0, 2u) \rangle$ $p > 2; 0 \leq u < p$ p conjugate subgroups for the prime p	$\mathbf{a}, \mathbf{b}, p\mathbf{c}$	0, 0, u
[p^2] $\mathbf{a}' = p\mathbf{a}, \mathbf{b}' = p\mathbf{b}$			
$P4_222$ (93)	$\langle 2 + (2u, 2v, 0); 3 + (u + v, -u + v, 0); 5 + (2u, 0, 0) \rangle$ $p > 2; 0 \leq u < p; 0 \leq v < p$ p^2 conjugate subgroups for the prime p	$p\mathbf{a}, p\mathbf{b}, \mathbf{c}$	$u, v, 0$

I Minimal *translationengleiche* supergroups[2] $P4_2/mmc$ (131); [2] $P4_2/mcm$ (132); [2] $P4_2/nbc$ (133); [2] $P4_2/nnm$ (134); [3] $P4_232$ (208)II Minimal non-isomorphic *klassengleiche* supergroups

• Additional centring translations

[2] $I422$ (97)

• Decreased unit cell

[2] $\mathbf{c}' = \frac{1}{2}\mathbf{c}$ $P422$ (89)