

$P4_2/nnm$

No. 134

 $P4_2/n2/n2/m$
 D_{4h}^{12}

 ORIGIN CHOICE 1, Origin at $\bar{4}2m$, at $-\frac{1}{4}, \frac{1}{4}, -\frac{1}{4}$ from centre ($2/m$)

Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; (2); (3); (5); (9)

General position

 Multiplicity,
Wyckoff letter,
Site symmetry

Coordinates

16	n	1	(1) x, y, z	(2) \bar{x}, \bar{y}, z	(3) $\bar{y} + \frac{1}{2}, x + \frac{1}{2}, z + \frac{1}{2}$	(4) $y + \frac{1}{2}, \bar{x} + \frac{1}{2}, z + \frac{1}{2}$
			(5) \bar{x}, y, \bar{z}	(6) x, \bar{y}, \bar{z}	(7) $y + \frac{1}{2}, x + \frac{1}{2}, \bar{z} + \frac{1}{2}$	(8) $\bar{y} + \frac{1}{2}, \bar{x} + \frac{1}{2}, \bar{z} + \frac{1}{2}$
			(9) $\bar{x} + \frac{1}{2}, \bar{y} + \frac{1}{2}, \bar{z} + \frac{1}{2}$	(10) $x + \frac{1}{2}, y + \frac{1}{2}, \bar{z} + \frac{1}{2}$	(11) y, \bar{x}, \bar{z}	(12) \bar{y}, x, \bar{z}
			(13) $x + \frac{1}{2}, \bar{y} + \frac{1}{2}, z + \frac{1}{2}$	(14) $\bar{x} + \frac{1}{2}, y + \frac{1}{2}, z + \frac{1}{2}$	(15) \bar{y}, \bar{x}, z	(16) y, x, z

I Maximal translationengleiche subgroups

[2] $P\bar{4}n2$ (118)	1; 2; 7; 8; 11; 12; 13; 14		
[2] $P\bar{4}2m$ (111)	1; 2; 5; 6; 11; 12; 15; 16		
[2] $P4_2nm$ (102)	1; 2; 3; 4; 13; 14; 15; 16		
[2] $P4_222$ (93)	1; 2; 3; 4; 5; 6; 7; 8		0, 1/2, 0
[2] $P4_2/n11$ (86, $P4_2/n$)	1; 2; 3; 4; 9; 10; 11; 12		
[2] $P2/n12/m$ (67, $Cmme$)	1; 2; 7; 8; 9; 10; 15; 16	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, \mathbf{c}$	1/4, 1/4, 1/4
[2] $P2/n2/n1$ (48, $Pnnn$)	1; 2; 5; 6; 9; 10; 13; 14		1/2, 1/2, 1/2

II Maximal klassengleiche subgroups

• Enlarged unit cell

[2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}, \mathbf{c}' = 2\mathbf{c}$			
$F4_1/ddc$ (142, $I4_1/acd$)	$\langle 2; 5; 9; 3 + (0,0,1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	1/2, 1/2, 0
$F4_1/ddc$ (142, $I4_1/acd$)	$\langle 2; (3; 5; 9) + (0,0,1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	1/2, 1/2, 1/2
$F4_1/ddc$ (142, $I4_1/acd$)	$\langle 2; 3; 9; 5 + (0,0,1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	
$F4_1/ddc$ (142, $I4_1/acd$)	$\langle 2; 3; 5; 9 + (0,0,1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
$F4_1/ddm$ (141, $I4_1/amd$)	$\langle 2; 9; (3; 5) + (0,0,1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	1/2, 1/2, 0
$F4_1/ddm$ (141, $I4_1/amd$)	$\langle 2; 5; (3; 9) + (0,0,1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	1/2, 1/2, 1/2
$F4_1/ddm$ (141, $I4_1/amd$)	$\langle 2; 3; 5; 9 \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	
$F4_1/ddm$ (141, $I4_1/amd$)	$\langle 2; 3; (5; 9) + (0,0,1) \rangle$	$\mathbf{a} - \mathbf{b}, \mathbf{a} + \mathbf{b}, 2\mathbf{c}$	0, 0, 1/2
[3] $\mathbf{c}' = 3\mathbf{c}$			
$P4_2/nnm$ (134)	$\langle 2; 5; (3; 9) + (0,0,1) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	
$P4_2/nnm$ (134)	$\langle 2; 3 + (0,0,1); 5 + (0,0,2); 9 + (0,0,3) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	0, 0, 1
$P4_2/nnm$ (134)	$\langle 2; 3 + (0,0,1); 5 + (0,0,4); 9 + (0,0,5) \rangle$	$\mathbf{a}, \mathbf{b}, 3\mathbf{c}$	0, 0, 2

• Series of maximal isomorphic subgroups

[p] $\mathbf{c}' = p\mathbf{c}$			
$P4_2/nnm$ (134)	$\langle 2; 3 + (0,0, \frac{p}{2} - \frac{1}{2}); 5 + (0,0, 2u); 9 + (0,0, \frac{p}{2} - \frac{1}{2} + 2u) \rangle$ $p > 2; 0 \leq u < p$ p conjugate subgroups for the prime p	$\mathbf{a}, \mathbf{b}, p\mathbf{c}$	0, 0, u
[p^2] $\mathbf{a}' = p\mathbf{a}, \mathbf{b}' = p\mathbf{b}$			
$P4_2/nnm$ (134)	$\langle 2 + (2u, 2v, 0); 3 + (\frac{p}{2} - \frac{1}{2} + u + v, \frac{p}{2} - \frac{1}{2} - u + v, 0); 5 + (2u, 0, 0); 9 + (\frac{p}{2} - \frac{1}{2} + 2u, \frac{p}{2} - \frac{1}{2} + 2v, 0) \rangle$ $p > 2; 0 \leq u < p; 0 \leq v < p$ p^2 conjugate subgroups for the prime p	$p\mathbf{a}, p\mathbf{b}, \mathbf{c}$	$u, v, 0$

I Minimal translationengleiche supergroups

 [3] $Pn\bar{3}m$ (224)

II Minimal non-isomorphic klassengleiche supergroups

• Additional centring translations

 [2] $C4_2/mcm$ (131, $P4_2/mmc$); [2] $I4/mmm$ (139)

• Decreased unit cell

 [2] $\mathbf{c}' = \frac{1}{2}\mathbf{c}$ $P4/nbm$ (125)

ORIGIN CHOICE 2, Origin at centre ($2/m$) at $nn(2_1/g, 2/m)$, at $\frac{1}{4}, -\frac{1}{4}, \frac{1}{4}$ from $\bar{4}2m$

Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; (2); (3); (5); (9)

General position

Multiplicity,
Wyckoff letter,
Site symmetry

Coordinates

16	n	1	(1) x, y, z	(2) $\bar{x} + \frac{1}{2}, \bar{y} + \frac{1}{2}, z$	(3) $\bar{y} + \frac{1}{2}, x, z + \frac{1}{2}$	(4) $y, \bar{x} + \frac{1}{2}, z + \frac{1}{2}$
			(5) $\bar{x} + \frac{1}{2}, y, \bar{z} + \frac{1}{2}$	(6) $x, \bar{y} + \frac{1}{2}, \bar{z} + \frac{1}{2}$	(7) y, x, \bar{z}	(8) $\bar{y} + \frac{1}{2}, \bar{x} + \frac{1}{2}, \bar{z}$
			(9) $\bar{x}, \bar{y}, \bar{z}$	(10) $x + \frac{1}{2}, y + \frac{1}{2}, \bar{z}$	(11) $y + \frac{1}{2}, \bar{x}, \bar{z} + \frac{1}{2}$	(12) $\bar{y}, x + \frac{1}{2}, \bar{z} + \frac{1}{2}$
			(13) $x + \frac{1}{2}, \bar{y}, z + \frac{1}{2}$	(14) $\bar{x}, y + \frac{1}{2}, z + \frac{1}{2}$	(15) \bar{y}, \bar{x}, z	(16) $y + \frac{1}{2}, x + \frac{1}{2}, z$

I Maximal translationengleiche subgroups

[2] $P\bar{4}n2$ (118)	1; 2; 7; 8; 11; 12; 13; 14		1/4, 3/4, 1/4
[2] $P\bar{4}2m$ (111)	1; 2; 5; 6; 11; 12; 15; 16		1/4, 3/4, 1/4
[2] $P4_2nm$ (102)	1; 2; 3; 4; 13; 14; 15; 16		1/4, 3/4, 0
[2] $P4_222$ (93)	1; 2; 3; 4; 5; 6; 7; 8		1/4, 1/4, 1/4
[2] $P4_2/n11$ (86, $P4_2/n$)	1; 2; 3; 4; 9; 10; 11; 12		0, 1/2, 0
[2] $P2/n12/m$ (67, $Cmme$)	1; 2; 7; 8; 9; 10; 15; 16	$\mathbf{a-b, a+b, c}$	0, 1/2, 0
[2] $P2/n2/n1$ (48, $Pnnn$)	1; 2; 5; 6; 9; 10; 13; 14		

II Maximal klassengleiche subgroups

• Enlarged unit cell

[2] $\mathbf{a}' = 2\mathbf{a}, \mathbf{b}' = 2\mathbf{b}, \mathbf{c}' = 2\mathbf{c}$			
$F4_1/ddc$ (142, $I4_1/acd$)	$\langle 5; 2 + (1,0,0); 3 + (0,1,1); 9 + (0,1,0) \rangle$	$\mathbf{a-b, a+b, 2c}$	0, 1/2, 0
$F4_1/ddc$ (142, $I4_1/acd$)	$\langle 2 + (1,0,0); (3; 9) + (0,1,1); 5 + (0,0,1) \rangle$	$\mathbf{a-b, a+b, 2c}$	0, 1/2, 1/2
$F4_1/ddc$ (142, $I4_1/acd$)	$\langle 2 + (1,0,0); (3; 9) + (0,1,0); 5 + (0,0,1) \rangle$	$\mathbf{a-b, a+b, 2c}$	1/2, 0, 0
$F4_1/ddc$ (142, $I4_1/acd$)	$\langle 5; 2 + (1,0,0); 3 + (0,1,0); 9 + (0,1,1) \rangle$	$\mathbf{a-b, a+b, 2c}$	1/2, 0, 1/2
$F4_1/ddm$ (141, $I4_1/amd$)	$\langle 2 + (1,0,0); 3 + (0,1,1); 5 + (0,0,1); 9 + (0,1,0) \rangle$	$\mathbf{a-b, a+b, 2c}$	0, 1/2, 0
$F4_1/ddm$ (141, $I4_1/amd$)	$\langle 5; 2 + (1,0,0); (3; 9) + (0,1,1) \rangle$	$\mathbf{a-b, a+b, 2c}$	0, 1/2, 1/2
$F4_1/ddm$ (141, $I4_1/amd$)	$\langle 5; 2 + (1,0,0); (3; 9) + (0,1,0) \rangle$	$\mathbf{a-b, a+b, 2c}$	1/2, 0, 0
$F4_1/ddm$ (141, $I4_1/amd$)	$\langle 2 + (1,0,0); 3 + (0,1,0); 5 + (0,0,1); 9 + (0,1,1) \rangle$	$\mathbf{a-b, a+b, 2c}$	1/2, 0, 1/2
[3] $\mathbf{c}' = 3\mathbf{c}$			
$P4_2/nnm$ (134)	$\langle 2; 9; (3; 5) + (0,0,1) \rangle$	$\mathbf{a, b, 3c}$	
$P4_2/nnm$ (134)	$\langle 2; 3 + (0,0,1); 5 + (0,0,3); 9 + (0,0,2) \rangle$	$\mathbf{a, b, 3c}$	0, 0, 1
$P4_2/nnm$ (134)	$\langle 2; 3 + (0,0,1); 5 + (0,0,5); 9 + (0,0,4) \rangle$	$\mathbf{a, b, 3c}$	0, 0, 2

• Series of maximal isomorphic subgroups

[p] $\mathbf{c}' = p\mathbf{c}$			
$P4_2/nnm$ (134)	$\langle 2; 3 + (0,0, \frac{p}{2} - \frac{1}{2}); 5 + (0,0, \frac{p}{2} - \frac{1}{2} + 2u); 9 + (0,0, 2u) \rangle$ $p > 2; 0 \leq u < p$ p conjugate subgroups for the prime p	$\mathbf{a, b, pc}$	0, 0, u
[p^2] $\mathbf{a}' = p\mathbf{a}, \mathbf{b}' = p\mathbf{b}$			
$P4_2/nnm$ (134)	$\langle 2 + (\frac{p}{2} - \frac{1}{2} + 2u, \frac{p}{2} - \frac{1}{2} + 2v, 0); 3 + (\frac{p}{2} - \frac{1}{2} + u + v, -u + v, 0); 5 + (\frac{p}{2} - \frac{1}{2} + 2u, 0, 0); 9 + (2u, 2v, 0) \rangle$ $p > 2; 0 \leq u < p; 0 \leq v < p$ p^2 conjugate subgroups for the prime p	$\mathbf{pa, pb, c}$	$u, v, 0$

I Minimal translationengleiche supergroups

[3] $Pn\bar{3}m$ (224)

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• Decreased unit cell

[2] $\mathbf{c}' = \frac{1}{2}\mathbf{c}$ $P4/nbm$ (125)