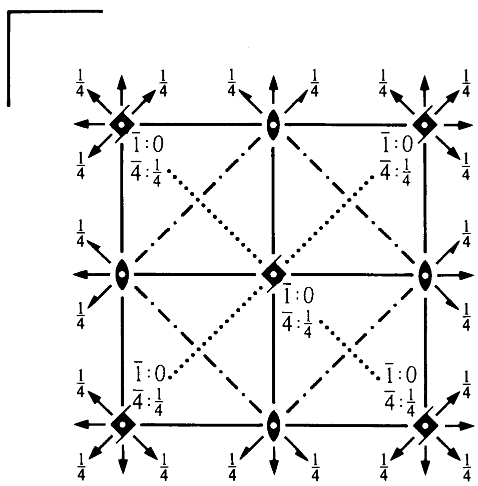
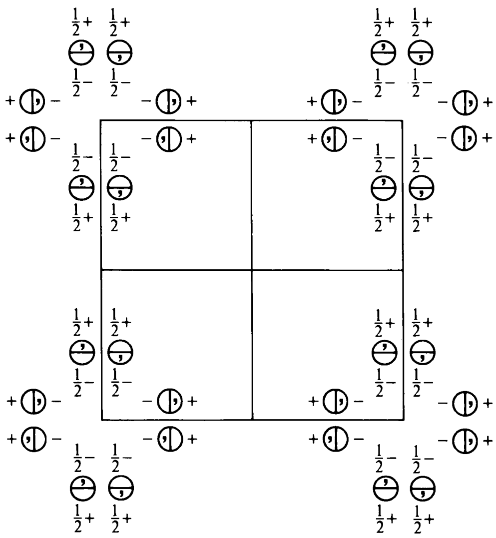
$P4_2/mmc$ D_{4h}^9 $4/mmm$ Tetragonal

No. 131 $P\ 4_2/m\ 2/m\ 2/c$ Patterson symmetry $P4/mmm$





Origin at centre (mmm) at $4_2/m2/mc$

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

Symmetry operations

(1) 1	(2) $2\ \ 0,0,z$	(3) $4^+(0,0,\frac{1}{2})\ \ 0,0,z$	(4) $4^-(0,0,\frac{1}{2})\ \ 0,0,z$
(5) $2\ \ 0,y,0$	(6) $2\ \ x,0,0$	(7) $2\ \ x,x,\frac{1}{4}$	(8) $2\ \ x,\bar{x},\frac{1}{4}$
(9) $\bar{1}\ \ 0,0,0$	(10) $m\ \ x,y,0$	(11) $\bar{4}^+\ \ 0,0,z;\ \ 0,0,\frac{1}{4}$	(12) $\bar{4}^-\ \ 0,0,z;\ \ 0,0,\frac{1}{4}$
(13) $m\ \ x,0,z$	(14) $m\ \ 0,y,z$	(15) $c\ \ x,\bar{x},z$	(16) $c\ \ x,x,z$

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

Positions

Multiplicity, Wyckoff letter, Site symmetry			Coordinates				Reflection conditions
							General:
16	*r*	1	(1) x,y,z	(2) $\bar{x},\bar{y},z$	(3) $\bar{y},x,z+\frac{1}{2}$	(4) $y,\bar{x},z+\frac{1}{2}$	hhl: $l=2n$
			(5) $\bar{x},y,\bar{z}$	(6) $x,\bar{y},\bar{z}$	(7) $y,x,\bar{z}+\frac{1}{2}$	(8) $\bar{y},\bar{x},\bar{z}+\frac{1}{2}$	$00l$: $l=2n$
			(9) $\bar{x},\bar{y},\bar{z}$	(10) $x,y,\bar{z}$	(11) $y,\bar{x},\bar{z}+\frac{1}{2}$	(12) $\bar{y},x,\bar{z}+\frac{1}{2}$	
			(13) $x,\bar{y},z$	(14) $\bar{x},y,z$	(15) $\bar{y},\bar{x},z+\frac{1}{2}$	(16) $y,x,z+\frac{1}{2}$	
							Special: as above, plus
8	*q*	$m\,.\,.$	$x,y,0$	$\bar{x},\bar{y},0$	$\bar{y},x,\frac{1}{2}$	$y,\bar{x},\frac{1}{2}$	no extra conditions
			$\bar{x},y,0$	$x,\bar{y},0$	$y,x,\frac{1}{2}$	$\bar{y},\bar{x},\frac{1}{2}$	
8	*p*	$.\,m\,.$	$\frac{1}{2},y,z$	$\frac{1}{2},\bar{y},z$	$\bar{y},\frac{1}{2},z+\frac{1}{2}$	$y,\frac{1}{2},z+\frac{1}{2}$	no extra conditions
			$\frac{1}{2},y,\bar{z}$	$\frac{1}{2},\bar{y},\bar{z}$	$y,\frac{1}{2},\bar{z}+\frac{1}{2}$	$\bar{y},\frac{1}{2},\bar{z}+\frac{1}{2}$	
8	*o*	$.\,m\,.$	$0,y,z$	$0,\bar{y},z$	$\bar{y},0,z+\frac{1}{2}$	$y,0,z+\frac{1}{2}$	no extra conditions
			$0,y,\bar{z}$	$0,\bar{y},\bar{z}$	$y,0,\bar{z}+\frac{1}{2}$	$\bar{y},0,\bar{z}+\frac{1}{2}$	
8	*n*	$.\,.\,2$	$x,x,\frac{1}{4}$	$\bar{x},\bar{x},\frac{1}{4}$	$\bar{x},x,\frac{3}{4}$	$x,\bar{x},\frac{3}{4}$	hkl: $l=2n$
			$\bar{x},\bar{x},\frac{3}{4}$	$x,x,\frac{3}{4}$	$x,\bar{x},\frac{1}{4}$	$\bar{x},x,\frac{1}{4}$	
4	*m*	$m\,2\,m\,.$	$x,\frac{1}{2},0$	$\bar{x},\frac{1}{2},0$	$\frac{1}{2},x,\frac{1}{2}$	$\frac{1}{2},\bar{x},\frac{1}{2}$	no extra conditions
4	*l*	$m\,2\,m\,.$	$x,0,\frac{1}{2}$	$\bar{x},0,\frac{1}{2}$	$0,x,0$	$0,\bar{x},0$	no extra conditions
4	*k*	$m\,2\,m\,.$	$x,\frac{1}{2},\frac{1}{2}$	$\bar{x},\frac{1}{2},\frac{1}{2}$	$\frac{1}{2},x,0$	$\frac{1}{2},\bar{x},0$	no extra conditions
4	*j*	$m\,2\,m\,.$	$x,0,0$	$\bar{x},0,0$	$0,x,\frac{1}{2}$	$0,\bar{x},\frac{1}{2}$	no extra conditions
4	*i*	$2\,m\,m\,.$	$0,\frac{1}{2},z$	$\frac{1}{2},0,z+\frac{1}{2}$	$0,\frac{1}{2},\bar{z}$	$\frac{1}{2},0,\bar{z}+\frac{1}{2}$	hkl: $h+k+l=2n$
4	*h*	$2\,m\,m\,.$	$\frac{1}{2},\frac{1}{2},z$	$\frac{1}{2},\frac{1}{2},z+\frac{1}{2}$	$\frac{1}{2},\frac{1}{2},\bar{z}$	$\frac{1}{2},\frac{1}{2},\bar{z}+\frac{1}{2}$	hkl: $l=2n$
4	*g*	$2\,m\,m\,.$	$0,0,z$	$0,0,z+\frac{1}{2}$	$0,0,\bar{z}$	$0,0,\bar{z}+\frac{1}{2}$	hkl: $l=2n$
2	*f*	$\bar{4}\,m\,2$	$\frac{1}{2},\frac{1}{2},\frac{1}{4}$	$\frac{1}{2},\frac{1}{2},\frac{3}{4}$			hkl: $l=2n$
2	*e*	$\bar{4}\,m\,2$	$0,0,\frac{1}{4}$	$0,0,\frac{3}{4}$			hkl: $l=2n$
2	*d*	$m\,m\,m\,.$	$0,\frac{1}{2},\frac{1}{2}$	$\frac{1}{2},0,0$			hkl: $h+k+l=2n$
2	*c*	$m\,m\,m\,.$	$0,\frac{1}{2},0$	$\frac{1}{2},0,\frac{1}{2}$			hkl: $h+k+l=2n$
2	*b*	$m\,m\,m\,.$	$\frac{1}{2},\frac{1}{2},0$	$\frac{1}{2},\frac{1}{2},\frac{1}{2}$			hkl: $l=2n$
2	*a*	$m\,m\,m\,.$	$0,0,0$	$0,0,\frac{1}{2}$			hkl: $l=2n$

Symmetry of special projections

Along [001] $p4mm$
$\mathbf{a}'=\mathbf{a}$ $\mathbf{b}'=\mathbf{b}$
Origin at $0,0,z$

Along [100] $p2mm$
$\mathbf{a}'=\mathbf{b}$ $\mathbf{b}'=\mathbf{c}$
Origin at $x,0,0$

Along [110] $p2mm$
$\mathbf{a}'=\frac{1}{2}(-\mathbf{a}+\mathbf{b})$ $\mathbf{b}'=\frac{1}{2}\mathbf{c}$
Origin at $x,x,0$