

MSG No. 128.409 P_C4/mnc [Type IV, tetragonal]

Table 1: Wyckoff site: 4a, site symmetry: 4'2'2

No.	position	mapping
1	$[0, \frac{1}{2}, \frac{1}{4}]$	[1,6,7,8,18,19,20,21]
2	$[\frac{1}{2}, 0, \frac{1}{4}]$	[2,3,4,5,17,22,23,24]
3	$[0, \frac{1}{2}, \frac{3}{4}]$	[9,14,15,16,26,27,28,29]
4	$[\frac{1}{2}, 0, \frac{3}{4}]$	[10,11,12,13,25,30,31,32]

Table 2: Wyckoff site: 4b, site symmetry: 4'/m..

No.	position	mapping
1	$[0, \frac{1}{2}, 0]$	[1,6,9,14,18,19,26,27]
2	$[\frac{1}{2}, 0, 0]$	[2,3,10,11,17,22,25,30]
3	$[\frac{1}{2}, 0, \frac{1}{2}]$	[4,5,12,13,23,24,31,32]
4	$[0, \frac{1}{2}, \frac{1}{2}]$	[7,8,15,16,20,21,28,29]

Table 3: Wyckoff site: 4c, site symmetry: 42'2'

No.	position	mapping
1	$[0, 0, \frac{1}{4}]$	[1,2,3,6,20,21,23,24]
2	$[\frac{1}{2}, \frac{1}{2}, \frac{1}{4}]$	[4,5,7,8,17,18,19,22]
3	$[0, 0, \frac{3}{4}]$	[9,10,11,14,28,29,31,32]
4	$[\frac{1}{2}, \frac{1}{2}, \frac{3}{4}]$	[12,13,15,16,25,26,27,30]

Table 4: Wyckoff site: 4d, site symmetry: 4/m..

No.	position	mapping
1	$[0, 0, 0]$	[1,2,3,6,9,10,11,14]
2	$[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}]$	[4,5,7,8,12,13,15,16]
3	$[\frac{1}{2}, \frac{1}{2}, 0]$	[17,18,19,22,25,26,27,30]
4	$[0, 0, \frac{1}{2}]$	[20,21,23,24,28,29,31,32]

Table 5: Wyckoff site: 8e, site symmetry: 2'/m..

No.	position	mapping
1	$[\frac{3}{4}, \frac{3}{4}, 0]$	[1,14,22,25]
2	$[\frac{1}{4}, \frac{3}{4}, 0]$	[2,11,19,26]

continued ...

Table 5

No.	position	mapping
3	$[\frac{3}{4}, \frac{1}{4}, 0]$	[3,10,18,27]
4	$[\frac{1}{4}, \frac{3}{4}, \frac{1}{2}]$	[4,13,21,28]
5	$[\frac{3}{4}, \frac{1}{4}, \frac{1}{2}]$	[5,12,20,29]
6	$[\frac{1}{4}, \frac{1}{4}, 0]$	[6,9,17,30]
7	$[\frac{1}{4}, \frac{1}{4}, \frac{1}{2}]$	[7,16,24,31]
8	$[\frac{3}{4}, \frac{3}{4}, \frac{1}{2}]$	[8,15,23,32]

Table 6: Wyckoff site: 8f, site symmetry: 2.22

No.	position	mapping
1	$[\frac{3}{4}, \frac{3}{4}, \frac{1}{4}]$	[1,8,22,23]
2	$[\frac{1}{4}, \frac{3}{4}, \frac{1}{4}]$	[2,4,19,21]
3	$[\frac{3}{4}, \frac{1}{4}, \frac{1}{4}]$	[3,5,18,20]
4	$[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}]$	[6,7,17,24]
5	$[\frac{1}{4}, \frac{1}{4}, \frac{3}{4}]$	[9,16,30,31]
6	$[\frac{3}{4}, \frac{1}{4}, \frac{3}{4}]$	[10,12,27,29]
7	$[\frac{1}{4}, \frac{3}{4}, \frac{3}{4}]$	[11,13,26,28]
8	$[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}]$	[14,15,25,32]

Table 7: Wyckoff site: 8g, site symmetry: 4' ..

No.	position	mapping
1	$[0, \frac{1}{2}, z]$	[1,6,18,19]
2	$[\frac{1}{2}, 0, z]$	[2,3,17,22]
3	$[\frac{1}{2}, 0, \frac{1}{2} - z]$	[4,5,23,24]
4	$[0, \frac{1}{2}, \frac{1}{2} - z]$	[7,8,20,21]
5	$[0, \frac{1}{2}, -z]$	[9,14,26,27]
6	$[\frac{1}{2}, 0, -z]$	[10,11,25,30]
7	$[\frac{1}{2}, 0, z + \frac{1}{2}]$	[12,13,31,32]
8	$[0, \frac{1}{2}, z + \frac{1}{2}]$	[15,16,28,29]

Table 8: Wyckoff site: 8h, site symmetry: 4..

No.	position	mapping
1	$[0, 0, z]$	[1,2,3,6]
2	$[\frac{1}{2}, \frac{1}{2}, \frac{1}{2} - z]$	[4,5,7,8]
3	$[0, 0, -z]$	[9,10,11,14]
4	$[\frac{1}{2}, \frac{1}{2}, z + \frac{1}{2}]$	[12,13,15,16]
5	$[\frac{1}{2}, \frac{1}{2}, z]$	[17,18,19,22]

continued ...

Table 8

No.	position	mapping
6	$[0, 0, \frac{1}{2} - z]$	[20, 21, 23, 24]
7	$[\frac{1}{2}, \frac{1}{2}, -z]$	[25, 26, 27, 30]
8	$[0, 0, z + \frac{1}{2}]$	[28, 29, 31, 32]

Table 9: Wyckoff site: 16i, site symmetry: $2' ..$

No.	position	mapping
1	$[\frac{3}{4}, \frac{3}{4}, z]$	[1, 22]
2	$[\frac{1}{4}, \frac{3}{4}, z]$	[2, 19]
3	$[\frac{3}{4}, \frac{1}{4}, z]$	[3, 18]
4	$[\frac{1}{4}, \frac{3}{4}, \frac{1}{2} - z]$	[4, 21]
5	$[\frac{3}{4}, \frac{1}{4}, \frac{1}{2} - z]$	[5, 20]
6	$[\frac{1}{4}, \frac{1}{4}, z]$	[6, 17]
7	$[\frac{1}{4}, \frac{1}{4}, \frac{1}{2} - z]$	[7, 24]
8	$[\frac{3}{4}, \frac{3}{4}, \frac{1}{2} - z]$	[8, 23]
9	$[\frac{1}{4}, \frac{1}{4}, -z]$	[9, 30]
10	$[\frac{3}{4}, \frac{1}{4}, -z]$	[10, 27]
11	$[\frac{1}{4}, \frac{3}{4}, -z]$	[11, 26]
12	$[\frac{3}{4}, \frac{1}{4}, z + \frac{1}{2}]$	[12, 29]
13	$[\frac{1}{4}, \frac{3}{4}, z + \frac{1}{2}]$	[13, 28]
14	$[\frac{3}{4}, \frac{3}{4}, -z]$	[14, 25]
15	$[\frac{3}{4}, \frac{3}{4}, z + \frac{1}{2}]$	[15, 32]
16	$[\frac{1}{4}, \frac{1}{4}, z + \frac{1}{2}]$	[16, 31]

Table 10: Wyckoff site: 16j, site symmetry: $.2' .$

No.	position	mapping
1	$[0, y, \frac{1}{4}]$	[1, 21]
2	$[-y, 0, \frac{1}{4}]$	[2, 24]
3	$[y, 0, \frac{1}{4}]$	[3, 23]
4	$[\frac{1}{2}, \frac{1}{2} - y, \frac{1}{4}]$	[4, 22]
5	$[\frac{1}{2}, y + \frac{1}{2}, \frac{1}{4}]$	[5, 17]
6	$[0, -y, \frac{1}{4}]$	[6, 20]
7	$[y + \frac{1}{2}, \frac{1}{2}, \frac{1}{4}]$	[7, 19]
8	$[\frac{1}{2} - y, \frac{1}{2}, \frac{1}{4}]$	[8, 18]
9	$[0, -y, \frac{3}{4}]$	[9, 29]
10	$[y, 0, \frac{3}{4}]$	[10, 32]
11	$[-y, 0, \frac{3}{4}]$	[11, 31]
12	$[\frac{1}{2}, y + \frac{1}{2}, \frac{3}{4}]$	[12, 30]
13	$[\frac{1}{2}, \frac{1}{2} - y, \frac{3}{4}]$	[13, 25]
14	$[0, y, \frac{3}{4}]$	[14, 28]
15	$[\frac{1}{2} - y, \frac{1}{2}, \frac{3}{4}]$	[15, 27]

continued ...

Table 10

No.	position	mapping
16	$[y + \frac{1}{2}, \frac{1}{2}, \frac{3}{4}]$	[16,26]

Table 11: Wyckoff site: 16k, site symmetry: ..2

No.	position	mapping
1	$[x, x + \frac{1}{2}, \frac{1}{4}]$	[1,7]
2	$[\frac{1}{2} - x, x, \frac{1}{4}]$	[2,5]
3	$[x + \frac{1}{2}, -x, \frac{1}{4}]$	[3,4]
4	$[-x, \frac{1}{2} - x, \frac{1}{4}]$	[6,8]
5	$[-x, \frac{1}{2} - x, \frac{3}{4}]$	[9,15]
6	$[x + \frac{1}{2}, -x, \frac{3}{4}]$	[10,13]
7	$[\frac{1}{2} - x, x, \frac{3}{4}]$	[11,12]
8	$[x, x + \frac{1}{2}, \frac{3}{4}]$	[14,16]
9	$[x + \frac{1}{2}, x, \frac{1}{4}]$	[17,23]
10	$[-x, x + \frac{1}{2}, \frac{1}{4}]$	[18,21]
11	$[x, \frac{1}{2} - x, \frac{1}{4}]$	[19,20]
12	$[\frac{1}{2} - x, -x, \frac{1}{4}]$	[22,24]
13	$[\frac{1}{2} - x, -x, \frac{3}{4}]$	[25,31]
14	$[x, \frac{1}{2} - x, \frac{3}{4}]$	[26,29]
15	$[-x, x + \frac{1}{2}, \frac{3}{4}]$	[27,28]
16	$[x + \frac{1}{2}, x, \frac{3}{4}]$	[30,32]

Table 12: Wyckoff site: 16l, site symmetry: ..2'

No.	position	mapping
1	$[x, x, \frac{1}{4}]$	[1,23]
2	$[-x, x, \frac{1}{4}]$	[2,21]
3	$[x, -x, \frac{1}{4}]$	[3,20]
4	$[x + \frac{1}{2}, \frac{1}{2} - x, \frac{1}{4}]$	[4,19]
5	$[\frac{1}{2} - x, x + \frac{1}{2}, \frac{1}{4}]$	[5,18]
6	$[-x, -x, \frac{1}{4}]$	[6,24]
7	$[x + \frac{1}{2}, x + \frac{1}{2}, \frac{1}{4}]$	[7,17]
8	$[\frac{1}{2} - x, \frac{1}{2} - x, \frac{1}{4}]$	[8,22]
9	$[-x, -x, \frac{3}{4}]$	[9,31]
10	$[x, -x, \frac{3}{4}]$	[10,29]
11	$[-x, x, \frac{3}{4}]$	[11,28]
12	$[\frac{1}{2} - x, x + \frac{1}{2}, \frac{3}{4}]$	[12,27]
13	$[x + \frac{1}{2}, \frac{1}{2} - x, \frac{3}{4}]$	[13,26]
14	$[x, x, \frac{3}{4}]$	[14,32]
15	$[\frac{1}{2} - x, \frac{1}{2} - x, \frac{3}{4}]$	[15,25]
16	$[x + \frac{1}{2}, x + \frac{1}{2}, \frac{3}{4}]$	[16,30]

Table 13: Wyckoff site: 16m, site symmetry: m..

No.	position	mapping
1	[$x, y, 0$]	[1,14]
2	[$-y, x, 0$]	[2,11]
3	[$y, -x, 0$]	[3,10]
4	[$x + \frac{1}{2}, \frac{1}{2} - y, \frac{1}{2}$]	[4,13]
5	[$\frac{1}{2} - x, y + \frac{1}{2}, \frac{1}{2}$]	[5,12]
6	[$-x, -y, 0$]	[6,9]
7	[$y + \frac{1}{2}, x + \frac{1}{2}, \frac{1}{2}$]	[7,16]
8	[$\frac{1}{2} - y, \frac{1}{2} - x, \frac{1}{2}$]	[8,15]
9	[$x + \frac{1}{2}, y + \frac{1}{2}, 0$]	[17,30]
10	[$\frac{1}{2} - y, x + \frac{1}{2}, 0$]	[18,27]
11	[$y + \frac{1}{2}, \frac{1}{2} - x, 0$]	[19,26]
12	[$x, -y, \frac{1}{2}$]	[20,29]
13	[$-x, y, \frac{1}{2}$]	[21,28]
14	[$\frac{1}{2} - x, \frac{1}{2} - y, 0$]	[22,25]
15	[$y, x, \frac{1}{2}$]	[23,32]
16	[$-y, -x, \frac{1}{2}$]	[24,31]

Table 14: Wyckoff site: 32n, site symmetry: 1

No.	position	mapping
1	[x, y, z]	[1]
2	[$-y, x, z$]	[2]
3	[$y, -x, z$]	[3]
4	[$x + \frac{1}{2}, \frac{1}{2} - y, \frac{1}{2} - z$]	[4]
5	[$\frac{1}{2} - x, y + \frac{1}{2}, \frac{1}{2} - z$]	[5]
6	[$-x, -y, z$]	[6]
7	[$y + \frac{1}{2}, x + \frac{1}{2}, \frac{1}{2} - z$]	[7]
8	[$\frac{1}{2} - y, \frac{1}{2} - x, \frac{1}{2} - z$]	[8]
9	[$-x, -y, -z$]	[9]
10	[$y, -x, -z$]	[10]
11	[$-y, x, -z$]	[11]
12	[$\frac{1}{2} - x, y + \frac{1}{2}, z + \frac{1}{2}$]	[12]
13	[$x + \frac{1}{2}, \frac{1}{2} - y, z + \frac{1}{2}$]	[13]
14	[$x, y, -z$]	[14]
15	[$\frac{1}{2} - y, \frac{1}{2} - x, z + \frac{1}{2}$]	[15]
16	[$y + \frac{1}{2}, x + \frac{1}{2}, z + \frac{1}{2}$]	[16]
17	[$x + \frac{1}{2}, y + \frac{1}{2}, z$]	[17]
18	[$\frac{1}{2} - y, x + \frac{1}{2}, z$]	[18]
19	[$y + \frac{1}{2}, \frac{1}{2} - x, z$]	[19]
20	[$x, -y, \frac{1}{2} - z$]	[20]
21	[$-x, y, \frac{1}{2} - z$]	[21]
22	[$\frac{1}{2} - x, \frac{1}{2} - y, z$]	[22]
23	[$y, x, \frac{1}{2} - z$]	[23]

continued ...

Table 14

No.	position	mapping
24	$[-y, -x, \frac{1}{2} - z]$	[24]
25	$[\frac{1}{2} - x, \frac{1}{2} - y, -z]$	[25]
26	$[y + \frac{1}{2}, \frac{1}{2} - x, -z]$	[26]
27	$[\frac{1}{2} - y, x + \frac{1}{2}, -z]$	[27]
28	$[-x, y, z + \frac{1}{2}]$	[28]
29	$[x, -y, z + \frac{1}{2}]$	[29]
30	$[x + \frac{1}{2}, y + \frac{1}{2}, -z]$	[30]
31	$[-y, -x, z + \frac{1}{2}]$	[31]
32	$[y, x, z + \frac{1}{2}]$	[32]