

SG No. 102  $C_{4v}^4$   $P4_2nm$  [ tetragonal ]

\* generator :  $\{2_{001}|0\}$ ,  $\{4_{001}^+|\frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ ,  $\{m_{010}|\frac{1}{2}\frac{1}{2}\frac{1}{2}\}$

\* symmetry operation + [0, 0, 0]

Table 1: Symmetry operations for 3d polar vector.

| No. | tag   | matrix (polar)   | det |
|-----|---|--|-----|
| 1   | $\{1 0\}$   | $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                                | 1   |
| 2   | $\{2_{001} 0\}$                                   | $\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                              | 1   |
| 3   | $\{4_{001}^+ \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & -1 & 0 & \frac{1}{2} \\ 1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | 1   |
| 4   | $\{4_{001}^- \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$ | $\begin{bmatrix} 0 & 1 & 0 & \frac{1}{2} \\ -1 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | 1   |
| 5   | $\{m_{010} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$   | $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{2} \\ 0 & -1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | -1  |
| 6   | $\{m_{100} \frac{1}{2}\frac{1}{2}\frac{1}{2}\}$   | $\begin{bmatrix} -1 & 0 & 0 & \frac{1}{2} \\ 0 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{bmatrix}$ | -1  |
| 7   | $\{m_{110} 0\}$                                   | $\begin{bmatrix} 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                              | -1  |
| 8   | $\{m_{1-10} 0\}$                                  | $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$                                | -1  |