

MPG No. 12.4.43 42'2' [ Type III, tetragonal ] [M tensor]

\* Rank 0 tensor. \* Rank 1 tensor.

$$[0 \ 0 \ M_z]$$

$$M_z = M_{pz}^{(1)}$$

\* Rank 2 tensor (s). \* Rank 2 tensor (a).

$$\begin{bmatrix} 0 & M_{xy} & 0 \\ -M_{xy} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$M_{xy} = T_{pz}^{(1)}$$

\* Rank 3 tensor (s).

$$\begin{bmatrix} 0 & 0 & M_{xxz} \\ 0 & 0 & M_{xxx} \\ 0 & 0 & M_{zzz} \\ 0 & M_{yzy} & 0 \\ M_{yzy} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$M_{xxz} = -M_{faz}^{(1)} + M_{pz}^{(1)}$$

$$M_{zzz} = 2M_{faz}^{(1)} + M_{pz}^{(1)} + 2M_{pz}^{(2)}$$

$$M_{yzy} = -M_{faz}^{(1)} + M_{pz}^{(2)}$$

\* Rank 3 tensor (a).

$$\begin{bmatrix} 0 & M_{yzy} & 0 \\ -M_{yzy} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$M_{yzy} = M_{pz}^{(3)}$$

\* Rank 4 tensor (sss).

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & M_{xxxx} \\ 0 & 0 & 0 & 0 & 0 & -M_{xxxx} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ M_{xxxx} & -M_{xxxx} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$M_{xxxx} = M_{gaz}^{(1)}$$

\* Rank 4 tensor (ssa).

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & M_{xxxx} \\ 0 & 0 & 0 & 0 & 0 & -M_{xxxx} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & M_{yzzx} & 0 \\ 0 & 0 & 0 & -M_{yzzx} & 0 & 0 \\ -M_{xxxx} & M_{xxxx} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$M_{xxxx} = -2T_{faz}^{(1)} + 2T_{pz}^{(1)}$$

$$M_{yzzx} = -4T_{faz}^{(1)} - T_{pz}^{(1)}$$

\* Rank 4 tensor (aas). \* Rank 4 tensor (aaa).

$$\begin{bmatrix} 0 & M_{yzzx} & 0 \\ -M_{yzzx} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$M_{yzzx} = -T_{pz}^{(2)}$$

\* Rank 4 tensor (sa).

$$\begin{bmatrix} 0 & 0 & M_{xxxz} \\ 0 & 0 & M_{xxxz} \\ 0 & 0 & M_{zzxy} \\ 0 & M_{yzzx} & 0 \\ M_{yzzx} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$M_{xxxz} = -T_{faz}^{(2)} + T_{pz}^{(3)}$$

$$M_{zzxy} = 2T_{faz}^{(2)} + T_{pz}^{(3)} + 2T_{pz}^{(4)}$$

$$M_{yzzx} = -T_{faz}^{(2)} + T_{pz}^{(4)}$$

\* Rank 4 tensor (as).

$$\begin{bmatrix} 0 & 0 & 0 & 0 & M_{yzzx} & 0 \\ 0 & 0 & 0 & M_{yzzx} & 0 & 0 \\ M_{xyxx} & M_{xyxx} & M_{xyzz} & 0 & 0 & 0 \end{bmatrix}$$

$$M_{yzzx} = -T_{faz}^{(3)} + T_{pz}^{(6)}$$

$$M_{xyxx} = -T_{faz}^{(3)} + T_{pz}^{(5)}$$

$$M_{xyzz} = 2T_{faz}^{(3)} + T_{pz}^{(5)} + 2T_{pz}^{(6)}$$

\* Rank 4 tensor (s).

$$\begin{bmatrix} 0 & 0 & 0 & 0 & 0 & M_{xxxz} & 0 & 0 & M_{xxxy} \\ 0 & 0 & 0 & 0 & 0 & -M_{xxxy} & 0 & 0 & -M_{xxxy} \\ 0 & 0 & 0 & 0 & 0 & M_{zzxy} & 0 & 0 & -M_{zzxy} \\ 0 & 0 & 0 & 0 & M_{yzzx} & 0 & 0 & M_{yzzx} & 0 \\ 0 & 0 & 0 & -M_{yzzx} & 0 & 0 & -M_{yzzx} & 0 & 0 \\ M_{xyxx} & -M_{xyxx} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$M_{xxxz} = M_{gaz}^{(1)} - 2T_{faz}^{(1)} - T_{faz}^{(2)} + 2T_{pz}^{(1)} + T_{pz}^{(3)}$$

$$M_{xxxy} = M_{gaz}^{(1)} - 2T_{faz}^{(1)} + T_{faz}^{(2)} + 2T_{pz}^{(1)} - T_{pz}^{(3)}$$

$$M_{zzxy} = 2T_{faz}^{(2)} + T_{pz}^{(3)} + 2T_{pz}^{(4)}$$

$$M_{yzzx} = -4T_{faz}^{(1)} - T_{faz}^{(2)} - T_{pz}^{(1)} + T_{pz}^{(4)}$$

$$M_{yzzx} = -4T_{faz}^{(1)} + T_{faz}^{(2)} - T_{pz}^{(1)} - T_{pz}^{(4)}$$

$$M_{xyxx} = M_{gaz}^{(1)} + 2T_{faz}^{(1)} - 2T_{pz}^{(1)}$$

\* Rank 4 tensor (a).

$$\begin{bmatrix} 0 & 0 & 0 & 0 & M_{yzzx} & 0 & 0 & M_{yzzx} & 0 \\ 0 & 0 & 0 & M_{yzzx} & 0 & 0 & M_{yzzx} & 0 & 0 \\ M_{xyxx} & M_{xyxx} & M_{xyzz} & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$M_{yzzx} = -T_{faz}^{(3)} - T_{pz}^{(2)} + T_{pz}^{(6)}$$

$$M_{yzzx} = -T_{faz}^{(3)} + T_{pz}^{(2)} + T_{pz}^{(6)}$$

$$M_{xyxx} = -T_{faz}^{(3)} + T_{pz}^{(5)}$$

$$M_{xyzz} = 2T_{faz}^{(3)} + T_{pz}^{(5)} + 2T_{pz}^{(6)}$$

\* Rank 4 tensor ( $t$ ).

$$\begin{bmatrix} 0 & M_{xxy} & 0 \\ -M_{xxxy} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ M_{xxxy} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & -M_{xxxy} & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$M_{xxxy} = M_{gaz}^{(1)}$$