

MPG No. 17.1.62 $\bar{3}$ [Type I, trigonal] [T tensor]

* Rank 0 tensor.

$$[T]$$

$$T = T_s^{(1)}$$

* Rank 1 tensor. * Rank 2 tensor (s).

$$\begin{bmatrix} T_{xx} & 0 & 0 \\ 0 & T_{xx} & 0 \\ 0 & 0 & T_{zz} \end{bmatrix}$$

$$T_{xx} = -T_{du}^{(1)} + T_s^{(1)}$$

$$T_{zz} = 2T_{du}^{(1)} + T_s^{(1)}$$

* Rank 2 tensor (a).

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

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

* Rank 3 tensor (s). * Rank 3 tensor (a). * Rank 4 tensor (sss).

$$\begin{bmatrix} T_{xxxx} & T_{xxyy} & T_{xxzz} & T_{xxyz} & T_{xxzx} & 0 \\ T_{xxyy} & T_{xxxx} & T_{xxzz} & -T_{xxyz} & -T_{xxzx} & 0 \\ T_{xxzz} & T_{xxzz} & T_{zzzz} & 0 & 0 & 0 \\ T_{xxyz} & -T_{xxyz} & 0 & T_{yzyz} & 0 & -T_{xxzx} \\ T_{xxzx} & -T_{xxzx} & 0 & 0 & T_{yzyz} & T_{xxyz} \\ 0 & 0 & 0 & -T_{xxzx} & T_{xxyz} & \frac{T_{xxxx}}{2} - \frac{T_{xxyy}}{2} \end{bmatrix}$$

$$T_{xxxx} = -2T_{du}^{(1)} - 4T_{du}^{(2)} + 3T_{g0}^{(1)} + T_s^{(1)} + 2T_s^{(2)}$$

$$T_{xxyy} = -2T_{du}^{(1)} + T_{g0}^{(1)} + T_s^{(1)}$$

$$T_{xxzz} = T_{du}^{(1)} - 4T_{g0}^{(1)} + T_s^{(1)}$$

$$T_{xxyz} = T_{gb}^{(1)}$$

$$T_{xxzx} = T_{ga}^{(1)}$$

$$T_{zzzz} = 4T_{du}^{(1)} + 8T_{du}^{(2)} + 8T_{g0}^{(1)} + T_s^{(1)} + 2T_s^{(2)}$$

$$T_{yzyz} = T_{du}^{(2)} - 4T_{g0}^{(1)} + T_s^{(2)}$$

* Rank 4 tensor (ssa).

$$\begin{bmatrix} 0 & 0 & T_{xxzz} & T_{xxyz} & T_{xxzx} & T_{xxyy} \\ 0 & 0 & T_{xxzz} & -T_{xxyz} & -T_{xxzx} & -T_{xxyy} \\ -T_{xxzz} & -T_{xxzz} & 0 & 0 & 0 & 0 \\ -T_{xxyz} & T_{xxyz} & 0 & 0 & T_{yzzz} & T_{xxzx} \\ -T_{xxzx} & T_{xxzx} & 0 & -T_{yzzz} & 0 & -T_{xxyz} \\ -T_{xxyy} & T_{xxyy} & 0 & -T_{xxzx} & T_{xxyz} & 0 \end{bmatrix}$$

$$T_{xxzz} = 3T_{du}^{(3)}$$

$$T_{xxyz} = 2M_{f2}^{(1)}$$

$$T_{xxzx} = -2M_{f1}^{(1)}$$

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

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

* Rank 4 tensor (aas).

$$\begin{bmatrix} T_{yzyz} & 0 & 0 \\ 0 & T_{yzyz} & 0 \\ 0 & 0 & T_{xyxy} \end{bmatrix}$$

$$\begin{aligned} T_{yzyz} &= -2T_{du}^{(4)} + T_s^{(3)} \\ T_{xyxy} &= 4T_{du}^{(4)} + T_s^{(3)} \end{aligned}$$

* Rank 4 tensor (aaa).

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

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

* Rank 4 tensor (sa).

$$\begin{bmatrix} T_{xxyz} & T_{xxzx} & T_{xxxz} \\ -T_{xxyz} & -T_{xxzx} & T_{xxxy} \\ 0 & 0 & T_{zzxy} \\ T_{yzyz} & T_{yzzx} & 0 \\ T_{yzzx} & -T_{yzyz} & 0 \\ T_{xxzx} & -T_{xxyz} & 0 \end{bmatrix}$$

$$T_{xxyz} = M_{f2}^{(2)}$$

$$T_{xxzx} = M_{f1}^{(2)}$$

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

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

$$T_{yzyz} = -3T_{du}^{(5)}$$

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

* Rank 4 tensor (as).

$$\begin{bmatrix} T_{yzxx} & -T_{yzxx} & 0 & T_{yzyz} & T_{yzzx} & T_{yzxy} \\ T_{yzxy} & -T_{yzxy} & 0 & T_{yzzx} & -T_{yzyz} & -T_{yzxx} \\ T_{xyxx} & T_{xyxx} & T_{xyzz} & 0 & 0 & 0 \end{bmatrix}$$

$$T_{yzxx} = M_{f2}^{(3)}$$

$$T_{yzyz} = -3T_{du}^{(6)}$$

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

$$T_{yzxy} = M_{f1}^{(3)}$$

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

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

* Rank 4 tensor (s).

$$\begin{bmatrix} T_{xxxx} & T_{xxyy} & T_{xxzz} & T_{xxyz} & T_{xxzx} & T_{xxxz} & T_{xxxy} & T_{xxzy} & T_{xxxz} & T_{xxyx} \\ T_{xxyy} & T_{xxxx} & T_{xxzz} & -T_{xxyz} & -T_{xxzx} & -T_{xxxz} & -T_{xxxy} & -T_{xxzy} & -T_{xxxz} & -T_{xxyx} \\ T_{zzxx} & T_{zzxx} & T_{zzzz} & 0 & 0 & T_{zzxy} & 0 & 0 & 0 & -T_{zzxy} \\ T_{yzzx} & -T_{yzzx} & 0 & T_{yzyz} & T_{yzzx} & T_{yzyy} & T_{yzyz} & T_{yzzx} & T_{yzyz} & T_{yzxy} \\ -T_{yzxy} & T_{yzxy} & 0 & -T_{yzxx} & T_{yzzy} & T_{yzxx} & -T_{yzxx} & T_{yzzy} & T_{yzxy} & T_{yzxx} \\ -\frac{T_{xxxz}}{2} - \frac{T_{xxyx}}{2} & \frac{T_{xxxz}}{2} + \frac{T_{xxyx}}{2} & 0 & -T_{xxzx} & T_{xxzy} & \frac{T_{xxxz} - T_{xxyx}}{2} & -T_{xxzx} & T_{xxzy} & \frac{T_{xxxz} - T_{xxyx}}{2} & \end{bmatrix}$$

$$\begin{aligned}
T_{xxxx} &= -2T_{du}^{(1)} - 4T_{du}^{(2)} + 3T_{g0}^{(1)} + T_s^{(1)} + 2T_s^{(2)} \\
T_{xxyy} &= -2T_{du}^{(1)} + T_{g0}^{(1)} + T_s^{(1)} \\
T_{xxzz} &= T_{du}^{(1)} + 3T_{du}^{(3)} - 4T_{g0}^{(1)} + T_s^{(1)} \\
T_{xxyz} &= 2M_{f2}^{(1)} + M_{f2}^{(2)} + T_{gb}^{(1)} \\
T_{xxzx} &= -2M_{f1}^{(1)} + M_{f1}^{(2)} + T_{ga}^{(1)} \\
T_{xxxz} &= -2M_{faz}^{(1)} - M_{faz}^{(2)} + 2M_{pz}^{(1)} + M_{pz}^{(3)} \\
T_{xxzy} &= 2M_{f2}^{(1)} - M_{f2}^{(2)} + T_{gb}^{(1)} \\
T_{xxxz} &= -2M_{f1}^{(1)} - M_{f1}^{(2)} + T_{ga}^{(1)} \\
T_{xxyx} &= -2M_{faz}^{(1)} + M_{faz}^{(2)} + 2M_{pz}^{(1)} - M_{pz}^{(3)} \\
T_{zzxx} &= T_{du}^{(1)} - 3T_{du}^{(3)} - 4T_{g0}^{(1)} + T_s^{(1)} \\
T_{zzzz} &= 4T_{du}^{(1)} + 8T_{du}^{(2)} + 8T_{g0}^{(1)} + T_s^{(1)} + 2T_s^{(2)} \\
T_{zzxy} &= 2M_{faz}^{(2)} + M_{pz}^{(3)} + 2M_{pz}^{(4)} \\
T_{yzxx} &= -2M_{f2}^{(1)} + T_{gb}^{(1)} \\
T_{yzyz} &= T_{du}^{(2)} - 3T_{du}^{(5)} - 4T_{g0}^{(1)} + T_s^{(2)} \\
T_{yzzx} &= -4M_{faz}^{(1)} - M_{faz}^{(2)} - M_{pz}^{(1)} + M_{pz}^{(4)} \\
T_{yzxy} &= -2M_{f1}^{(1)} - T_{ga}^{(1)} \\
T_{yzzy} &= T_{du}^{(2)} + 3T_{du}^{(5)} - 4T_{g0}^{(1)} + T_s^{(2)} \\
T_{yzxz} &= -4M_{faz}^{(1)} + M_{faz}^{(2)} - M_{pz}^{(1)} - M_{pz}^{(4)}
\end{aligned}$$

* Rank 4 tensor (a).

$$\begin{bmatrix}
T_{yzxx} & -T_{yzxx} & 0 & T_{yzyz} & T_{yzzx} & T_{yzxy} & T_{yzyz} & T_{yzzx} & T_{yzxy} \\
T_{yzyx} & -T_{yzyx} & 0 & T_{yzzx} & -T_{yzyz} & -T_{yzzx} & T_{yzzx} & -T_{yzyz} & -T_{yzzx} \\
T_{xyxx} & T_{xyxx} & T_{xyzz} & 0 & 0 & T_{xyxy} & 0 & 0 & -T_{xyxy}
\end{bmatrix}$$

$$\begin{aligned}
T_{yzxx} &= M_{f2}^{(3)} \\
T_{yzyz} &= -2T_{du}^{(4)} - 3T_{du}^{(6)} + T_s^{(3)} \\
T_{yzzx} &= -M_{faz}^{(3)} - M_{pz}^{(2)} + M_{pz}^{(6)} \\
T_{yzxy} &= M_{f1}^{(3)} \\
T_{yzyy} &= 2T_{du}^{(4)} - 3T_{du}^{(6)} - T_s^{(3)} \\
T_{yzxz} &= -M_{faz}^{(3)} + M_{pz}^{(2)} + M_{pz}^{(6)} \\
T_{xyxx} &= -M_{faz}^{(3)} + M_{pz}^{(5)} \\
T_{xyzz} &= 2M_{faz}^{(3)} + M_{pz}^{(5)} + 2M_{pz}^{(6)} \\
T_{xyxy} &= 4T_{du}^{(4)} + T_s^{(3)}
\end{aligned}$$

* Rank 4 tensor (t).

$$\begin{bmatrix}
T_{xxxx} & 0 & T_{xxxx} \\
0 & T_{xxxx} & T_{yyyz} \\
0 & 0 & T_{zzzz} \\
-T_{xxxx} & T_{yyyz} & T_{yyzz} \\
T_{zzxx} & 0 & 0 \\
0 & T_{xxyy} & -T_{yyyz} \\
0 & T_{yzyy} & 0 \\
T_{xxzx} & -T_{yyyz} & -\frac{T_{xxxx}}{2} + \frac{3T_{xxyy}}{2} + T_{yyzz} - T_{yzyy} + T_{zzxx} \\
\frac{T_{xxxx}}{2} - \frac{T_{xxyy}}{2} & 0 & -T_{xxxx} \\
-T_{yyyz} & -T_{xxxx} & 0
\end{bmatrix}$$

$$T_{xxxx} = -2T_{du}^{(1)} - 4T_{du}^{(2)} + 3T_{g0}^{(1)} + 3T_s^{(1)}$$

$$T_{xxxz} = T_{ga}^{(1)}$$

$$T_{yyyz} = -T_{gb}^{(1)}$$

$$T_{zzzz} = 4T_{du}^{(1)} + 8T_{du}^{(2)} + 8T_{g0}^{(1)} + 3T_s^{(1)}$$

$$T_{yyzz} = T_{du}^{(1)} + 3T_{du}^{(3)} - 4T_{g0}^{(1)} + T_s^{(1)}$$

$$T_{zzxx} = T_{du}^{(1)} - 3T_{du}^{(3)} - 4T_{g0}^{(1)} + T_s^{(1)}$$

$$T_{xxyy} = -2T_{du}^{(1)} + T_{g0}^{(1)} + T_s^{(1)}$$

$$T_{yzyy} = T_{du}^{(2)} + 3T_{du}^{(5)} - 4T_{g0}^{(1)} + T_s^{(1)}$$