

MPG No. 6.3.19 2'2'2 (2'2'2 setting) [Type III, orthorhombic] [G tensor]

* Rank 0 tensor.

$$[G]$$

$$G = G_s^{(1)}$$

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

$$\begin{bmatrix} G_{xx} & 0 & 0 \\ 0 & G_{yy} & 0 \\ 0 & 0 & G_{zz} \end{bmatrix}$$

$$G_{xx} = -G_{du}^{(1)} + G_{dv}^{(1)} + G_s^{(1)}$$

$$G_{yy} = -G_{du}^{(1)} - G_{dv}^{(1)} + G_s^{(1)}$$

$$G_{zz} = 2G_{du}^{(1)} + G_s^{(1)}$$

* Rank 2 tensor (a). * Rank 3 tensor (s).

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ G_{yzx} & 0 & 0 \\ 0 & G_{zxy} & 0 \\ 0 & 0 & G_{xyz} \end{bmatrix}$$

$$G_{yzx} = G_{f3}^{(1)} - 3Q_{du}^{(1)} - Q_{dv}^{(1)}$$

$$G_{zxy} = G_{f3}^{(1)} + 3Q_{du}^{(1)} - Q_{dv}^{(1)}$$

$$G_{xyz} = G_{f3}^{(1)} + 2Q_{dv}^{(1)}$$

* Rank 3 tensor (a).

$$\begin{bmatrix} G_{yzx} & 0 & 0 \\ 0 & G_{zxy} & 0 \\ 0 & 0 & G_{xyz} \end{bmatrix}$$

$$G_{yzx} = -Q_{du}^{(2)} + Q_{dv}^{(2)} + Q_s^{(1)}$$

$$G_{zxy} = -Q_{du}^{(2)} - Q_{dv}^{(2)} + Q_s^{(1)}$$

$$G_{xyz} = 2Q_{du}^{(2)} + Q_s^{(1)}$$

* Rank 4 tensor (sss).

$$\begin{bmatrix} G_{xxxx} & G_{xxyy} & G_{xxzz} & 0 & 0 & 0 \\ G_{xxyy} & G_{yyyy} & G_{yyzz} & 0 & 0 & 0 \\ G_{xxzz} & G_{yyzz} & G_{zzzz} & 0 & 0 & 0 \\ 0 & 0 & 0 & G_{yzyz} & 0 & 0 \\ 0 & 0 & 0 & 0 & G_{zxzx} & 0 \\ 0 & 0 & 0 & 0 & 0 & G_{xyxy} \end{bmatrix}$$

$$\begin{aligned}
G_{xxxx} &= -2G_{du}^{(1)} - 4G_{du}^{(2)} + 2G_{dv}^{(1)} + 4G_{dv}^{(2)} - G_{gu}^{(1)} + G_{gv}^{(1)} + 2G_g^{(1)} + G_s^{(1)} + 2G_s^{(2)} \\
G_{xxyy} &= -2G_{du}^{(1)} + 2G_{gu}^{(1)} - G_g^{(1)} + G_s^{(1)} \\
G_{xxzz} &= G_{du}^{(1)} + G_{dv}^{(1)} - G_{gu}^{(1)} - G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)} \\
G_{yyyy} &= -2G_{du}^{(1)} - 4G_{du}^{(2)} - 2G_{dv}^{(1)} - 4G_{dv}^{(2)} - G_{gu}^{(1)} - G_{gv}^{(1)} + 2G_g^{(1)} + G_s^{(1)} + 2G_s^{(2)} \\
G_{yyzz} &= G_{du}^{(1)} - G_{dv}^{(1)} - G_{gu}^{(1)} + G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)} \\
G_{zzzz} &= 4G_{du}^{(1)} + 8G_{du}^{(2)} + 2G_{gu}^{(1)} + 2G_g^{(1)} + G_s^{(1)} + 2G_s^{(2)} \\
G_{yzyz} &= G_{du}^{(2)} - G_{dv}^{(2)} - G_{gu}^{(1)} + G_{gv}^{(1)} - G_g^{(1)} + G_s^{(2)} \\
G_{zxzx} &= G_{du}^{(2)} + G_{dv}^{(2)} - G_{gu}^{(1)} - G_{gv}^{(1)} - G_g^{(1)} + G_s^{(2)} \\
G_{xyxy} &= -2G_{du}^{(2)} + 2G_{gu}^{(1)} - G_g^{(1)} + G_s^{(2)}
\end{aligned}$$

* Rank 4 tensor (ssa).

$$\begin{bmatrix} 0 & G_{xxyy} & G_{xxzz} & 0 & 0 & 0 \\ -G_{xxyy} & 0 & G_{yyzz} & 0 & 0 & 0 \\ -G_{xxzz} & -G_{yyzz} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{aligned}
G_{xxyy} &= -2G_{dv}^{(3)} + 4Q_{f3}^{(1)} \\
G_{xxzz} &= 3G_{du}^{(3)} - G_{dv}^{(3)} - 4Q_{f3}^{(1)} \\
G_{yyzz} &= 3G_{du}^{(3)} + G_{dv}^{(3)} + 4Q_{f3}^{(1)}
\end{aligned}$$

* Rank 4 tensor (aas).

$$\begin{bmatrix} G_{yzyz} & 0 & 0 \\ 0 & G_{zxzx} & 0 \\ 0 & 0 & G_{xyxy} \end{bmatrix}$$

$$\begin{aligned}
G_{yzyz} &= -2G_{du}^{(4)} + 2G_{dv}^{(4)} + G_s^{(3)} \\
G_{zxzx} &= -2G_{du}^{(4)} - 2G_{dv}^{(4)} + G_s^{(3)} \\
G_{xyxy} &= 4G_{du}^{(4)} + G_s^{(3)}
\end{aligned}$$

* Rank 4 tensor (aaa). * Rank 4 tensor (sa).

$$\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ G_{yzyz} & 0 & 0 \\ 0 & G_{zxzx} & 0 \\ 0 & 0 & G_{xyxy} \end{bmatrix}$$

$$\begin{aligned}
G_{yzyz} &= -3G_{du}^{(5)} - G_{dv}^{(5)} + Q_{f3}^{(2)} \\
G_{zxzx} &= 3G_{du}^{(5)} - G_{dv}^{(5)} + Q_{f3}^{(2)} \\
G_{xyxy} &= 2G_{dv}^{(5)} + Q_{f3}^{(2)}
\end{aligned}$$

* Rank 4 tensor (as).

$$\begin{bmatrix} 0 & 0 & 0 & G_{yzyz} & 0 & 0 \\ 0 & 0 & 0 & 0 & G_{zxzx} & 0 \\ 0 & 0 & 0 & 0 & 0 & G_{xyxy} \end{bmatrix}$$

$$G_{yzyz} = -3G_{du}^{(6)} - G_{dv}^{(6)} + Q_{f3}^{(3)}$$

$$G_{zxzx} = 3G_{du}^{(6)} - G_{dv}^{(6)} + Q_{f3}^{(3)}$$

$$G_{xyxy} = 2G_{dv}^{(6)} + Q_{f3}^{(3)}$$

* Rank 4 tensor (s).

$$\begin{bmatrix} G_{xxxx} & G_{xxyy} & G_{xxzz} & 0 & 0 & 0 & 0 & 0 & 0 \\ G_{yyxx} & G_{yyyy} & G_{yyzz} & 0 & 0 & 0 & 0 & 0 & 0 \\ G_{zzxx} & G_{zzyy} & G_{zzzz} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & G_{yzyz} & 0 & 0 & G_{yzyy} & 0 & 0 \\ 0 & 0 & 0 & 0 & G_{zxzx} & 0 & 0 & G_{zxzx} & 0 \\ 0 & 0 & 0 & 0 & 0 & G_{xyxy} & 0 & 0 & G_{xyyx} \end{bmatrix}$$

$$G_{xxxx} = -2G_{du}^{(1)} - 4G_{du}^{(2)} + 2G_{dv}^{(1)} + 4G_{dv}^{(2)} - G_{gu}^{(1)} + G_{gv}^{(1)} + 2G_g^{(1)} + G_s^{(1)} + 2G_s^{(2)}$$

$$G_{xxyy} = -2G_{du}^{(1)} - 2G_{dv}^{(3)} + 2G_{gu}^{(1)} - G_g^{(1)} + G_s^{(1)} + 4Q_{f3}^{(1)}$$

$$G_{xxzz} = G_{du}^{(1)} + 3G_{du}^{(3)} + G_{dv}^{(1)} - G_{dv}^{(3)} - G_{gu}^{(1)} - G_{gv}^{(1)} + G_g^{(1)} + G_s^{(1)} - 4Q_{f3}^{(1)}$$

$$G_{yyxx} = -2G_{du}^{(1)} + 2G_{dv}^{(3)} + 2G_{gu}^{(1)} - G_g^{(1)} + G_s^{(1)} - 4Q_{f3}^{(1)}$$

$$G_{yyyy} = -2G_{du}^{(1)} - 4G_{du}^{(2)} - 2G_{dv}^{(1)} - 4G_{dv}^{(2)} - G_{gu}^{(1)} - G_{gv}^{(1)} + 2G_g^{(1)} + G_s^{(1)} + 2G_s^{(2)}$$

$$G_{yyzz} = G_{du}^{(1)} + 3G_{du}^{(3)} - G_{dv}^{(1)} + G_{dv}^{(3)} - G_{gu}^{(1)} + G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)} + 4Q_{f3}^{(1)}$$

$$G_{zzxx} = G_{du}^{(1)} - 3G_{du}^{(3)} + G_{dv}^{(1)} + G_{dv}^{(3)} - G_{gu}^{(1)} - G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)} + 4Q_{f3}^{(1)}$$

$$G_{zzyy} = G_{du}^{(1)} - 3G_{du}^{(3)} - G_{dv}^{(1)} - G_{dv}^{(3)} - G_{gu}^{(1)} + G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)} - 4Q_{f3}^{(1)}$$

$$G_{zzzz} = 4G_{du}^{(1)} + 8G_{du}^{(2)} + 2G_{gu}^{(1)} + 2G_g^{(1)} + G_s^{(1)} + 2G_s^{(2)}$$

$$G_{yzyz} = G_{du}^{(2)} - 3G_{du}^{(5)} - G_{dv}^{(2)} - G_{dv}^{(5)} - G_{gu}^{(1)} + G_{gv}^{(1)} - G_g^{(1)} + G_s^{(2)} + Q_{f3}^{(2)}$$

$$G_{yzyy} = G_{du}^{(2)} + 3G_{du}^{(5)} - G_{dv}^{(2)} + G_{dv}^{(5)} - G_{gu}^{(1)} + G_{gv}^{(1)} - G_g^{(1)} + G_s^{(2)} - Q_{f3}^{(2)}$$

$$G_{zxzx} = G_{du}^{(2)} + 3G_{du}^{(5)} + G_{dv}^{(2)} - G_{dv}^{(5)} - G_{gu}^{(1)} - G_{gv}^{(1)} - G_g^{(1)} + G_s^{(2)} + Q_{f3}^{(2)}$$

$$G_{zxzx} = G_{du}^{(2)} - 3G_{du}^{(5)} + G_{dv}^{(2)} + G_{dv}^{(5)} - G_{gu}^{(1)} - G_{gv}^{(1)} - G_g^{(1)} + G_s^{(2)} - Q_{f3}^{(2)}$$

$$G_{xyxy} = -2G_{du}^{(2)} + 2G_{dv}^{(5)} + 2G_{gu}^{(1)} - G_g^{(1)} + G_s^{(2)} + Q_{f3}^{(2)}$$

$$G_{xyyx} = -2G_{du}^{(2)} - 2G_{dv}^{(5)} + 2G_{gu}^{(1)} - G_g^{(1)} + G_s^{(2)} - Q_{f3}^{(2)}$$

* Rank 4 tensor (a).

$$\begin{bmatrix} 0 & 0 & 0 & G_{yzyz} & 0 & 0 & G_{yzyy} & 0 & 0 \\ 0 & 0 & 0 & 0 & G_{zxzx} & 0 & 0 & G_{zxzx} & 0 \\ 0 & 0 & 0 & 0 & 0 & G_{xyxy} & 0 & 0 & G_{xyyx} \end{bmatrix}$$

$$G_{yzyz} = -2G_{du}^{(4)} - 3G_{du}^{(6)} + 2G_{dv}^{(4)} - G_{dv}^{(6)} + G_s^{(3)} + Q_{f3}^{(3)}$$

$$G_{yzyy} = 2G_{du}^{(4)} - 3G_{du}^{(6)} - 2G_{dv}^{(4)} - G_{dv}^{(6)} - G_s^{(3)} + Q_{f3}^{(3)}$$

$$G_{zxzx} = -2G_{du}^{(4)} + 3G_{du}^{(6)} - 2G_{dv}^{(4)} - G_{dv}^{(6)} + G_s^{(3)} + Q_{f3}^{(3)}$$

$$G_{zxzx} = 2G_{du}^{(4)} + 3G_{du}^{(6)} + 2G_{dv}^{(4)} - G_{dv}^{(6)} - G_s^{(3)} + Q_{f3}^{(3)}$$

$$G_{xyxy} = 4G_{du}^{(4)} + 2G_{dv}^{(6)} + G_s^{(3)} + Q_{f3}^{(3)}$$

$$G_{xyyx} = -4G_{du}^{(4)} + 2G_{dv}^{(6)} - G_s^{(3)} + Q_{f3}^{(3)}$$

* Rank 4 tensor (t).

$$\begin{bmatrix} G_{xxxx} & 0 & 0 \\ 0 & G_{yyyy} & 0 \\ 0 & 0 & G_{zzzz} \\ 0 & 0 & G_{yyzz} \\ G_{zzxx} & 0 & 0 \\ 0 & G_{xxyy} & 0 \\ 0 & G_{yzzy} & 0 \\ 0 & 0 & G_{zxxx} \\ G_{xxyy} + G_{yyzz} - G_{yzzy} - G_{zxxx} + G_{zzxx} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$G_{xxxx} = -2G_{du}^{(1)} - 4G_{du}^{(2)} + 2G_{dv}^{(1)} + 4G_{dv}^{(2)} - G_{gu}^{(1)} + G_{gv}^{(1)} + 2G_g^{(1)} + 3G_s^{(1)}$$

$$G_{yyyy} = -2G_{du}^{(1)} - 4G_{du}^{(2)} - 2G_{dv}^{(1)} - 4G_{dv}^{(2)} - G_{gu}^{(1)} - G_{gv}^{(1)} + 2G_g^{(1)} + 3G_s^{(1)}$$

$$G_{zzzz} = 4G_{du}^{(1)} + 8G_{du}^{(2)} + 2G_{gu}^{(1)} + 2G_g^{(1)} + 3G_s^{(1)}$$

$$G_{yyzz} = G_{du}^{(1)} + 3G_{du}^{(3)} - G_{dv}^{(1)} + G_{dv}^{(3)} - G_{gu}^{(1)} + G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)}$$

$$G_{zzxx} = G_{du}^{(1)} - 3G_{du}^{(3)} + G_{dv}^{(1)} + G_{dv}^{(3)} - G_{gu}^{(1)} - G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)}$$

$$G_{xxyy} = -2G_{du}^{(1)} - 2G_{dv}^{(3)} + 2G_{gu}^{(1)} - G_g^{(1)} + G_s^{(1)}$$

$$G_{yzzy} = G_{du}^{(2)} + 3G_{du}^{(5)} - G_{dv}^{(2)} + G_{dv}^{(5)} - G_{gu}^{(1)} + G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)}$$

$$G_{zxxx} = G_{du}^{(2)} - 3G_{du}^{(5)} + G_{dv}^{(2)} + G_{dv}^{(5)} - G_{gu}^{(1)} - G_{gv}^{(1)} - G_g^{(1)} + G_s^{(1)}$$