

MPG No. 3.1.6 2 [ Type I, monoclinic ] [M tensor]

\* Rank 0 tensor.

$$[M]$$

$$M = M_s^{(1)}$$

\* Rank 1 tensor.

$$[0 \quad M_y \quad 0]$$

$$M_y = M_{py}^{(1)}$$

\* Rank 2 tensor (s).

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

$$M_{xx} = -M_{du}^{(1)} + M_{dv}^{(1)} + M_s^{(1)}$$

$$M_{xz} = M_{dxz}^{(1)}$$

$$M_{yy} = -M_{du}^{(1)} - M_{dv}^{(1)} + M_s^{(1)}$$

$$M_{zz} = 2M_{du}^{(1)} + M_s^{(1)}$$

\* Rank 2 tensor (a).

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

$$M_{xz} = -T_{py}^{(1)}$$

\* Rank 3 tensor (s).

$$\begin{bmatrix} 0 & M_{xxy} & 0 \\ 0 & M_{yyy} & 0 \\ 0 & M_{zzy} & 0 \\ M_{yzz} & 0 & M_{yzz} \\ 0 & M_{zxy} & 0 \\ M_{xyx} & 0 & M_{xyz} \end{bmatrix}$$

$$M_{xxy} = -M_{fay}^{(1)} - M_{fbz}^{(1)} + M_{py}^{(1)} + 2T_{dxz}^{(1)}$$

$$M_{yyy} = 2M_{fay}^{(1)} + M_{py}^{(1)} + 2M_{py}^{(2)}$$

$$M_{zzy} = -M_{fay}^{(1)} + M_{fbz}^{(1)} + M_{py}^{(1)} - 2T_{dxz}^{(1)}$$

$$M_{yzz} = M_{f3}^{(1)} - 3T_{du}^{(1)} - T_{dv}^{(1)}$$

$$M_{yzz} = -M_{fay}^{(1)} + M_{fbz}^{(1)} + M_{py}^{(2)} + T_{dxz}^{(1)}$$

$$M_{zxy} = M_{f3}^{(1)} + 3T_{du}^{(1)} - T_{dv}^{(1)}$$

$$M_{xyx} = -M_{fay}^{(1)} - M_{fbz}^{(1)} + M_{py}^{(2)} - T_{dxz}^{(1)}$$

$$M_{xyz} = M_{f3}^{(1)} + 2T_{dv}^{(1)}$$

\* Rank 3 tensor (a).

$$\begin{bmatrix} M_{yzz} & 0 & M_{yzz} \\ 0 & M_{zxy} & 0 \\ M_{xyx} & 0 & M_{xyz} \end{bmatrix}$$

$$M_{yzz} = -T_{du}^{(2)} + T_{dv}^{(2)} + T_s^{(1)}$$

$$M_{yzz} = -M_{py}^{(3)} + T_{dxz}^{(2)}$$

$$M_{zxy} = -T_{du}^{(2)} - T_{dv}^{(2)} + T_s^{(1)}$$

$$M_{xyx} = M_{py}^{(3)} + T_{dxz}^{(2)}$$

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

\* Rank 4 tensor (sss).

$$\begin{bmatrix} M_{xxxx} & M_{xxyy} & M_{xxzz} & 0 & M_{xxzx} & 0 \\ M_{xxyy} & M_{yyyy} & M_{yyzz} & 0 & M_{yyzx} & 0 \\ M_{xxzz} & M_{yyzz} & M_{zzzz} & 0 & M_{zzzx} & 0 \\ 0 & 0 & 0 & M_{yzyz} & 0 & M_{yzxy} \\ M_{xxzx} & M_{yyzx} & M_{zzzx} & 0 & M_{zxzx} & 0 \\ 0 & 0 & 0 & M_{yzxy} & 0 & M_{xyxy} \end{bmatrix}$$

$$M_{xxxx} = -2M_{du}^{(1)} - 4M_{du}^{(2)} + 2M_{dv}^{(1)} + 4M_{dv}^{(2)} - M_{gu}^{(1)} + M_{gv}^{(1)} + 2M_g^{(1)} + M_s^{(1)} + 2M_s^{(2)}$$

$$M_{xxyy} = -2M_{du}^{(1)} + 2M_{gu}^{(1)} - M_g^{(1)} + M_s^{(1)}$$

$$M_{xxzz} = M_{du}^{(1)} + M_{dv}^{(1)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)}$$

$$M_{xxzx} = M_{dxz}^{(1)} + 2M_{dxz}^{(2)} - M_{gaxy}^{(1)} - M_{gbxy}^{(1)}$$

$$M_{yyyy} = -2M_{du}^{(1)} - 4M_{du}^{(2)} - 2M_{dv}^{(1)} - 4M_{dv}^{(2)} - M_{gu}^{(1)} - M_{gv}^{(1)} + 2M_g^{(1)} + M_s^{(1)} + 2M_s^{(2)}$$

$$M_{yyzz} = M_{du}^{(1)} - M_{dv}^{(1)} - M_{gu}^{(1)} + M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)}$$

$$M_{yyzx} = M_{dxz}^{(1)} + 2M_{gbxy}^{(1)}$$

$$M_{zzzz} = 4M_{du}^{(1)} + 8M_{du}^{(2)} + 2M_{gu}^{(1)} + 2M_g^{(1)} + M_s^{(1)} + 2M_s^{(2)}$$

$$M_{zzzx} = M_{dxz}^{(1)} + 2M_{dxz}^{(2)} + M_{gaxy}^{(1)} - M_{gbxy}^{(1)}$$

$$M_{yzyz} = M_{du}^{(2)} - M_{dv}^{(2)} - M_{gu}^{(1)} + M_{gv}^{(1)} - M_g^{(1)} + M_s^{(2)}$$

$$M_{yzxy} = M_{dxz}^{(2)} + 2M_{gbxy}^{(1)}$$

$$M_{zxzx} = M_{du}^{(2)} + M_{dv}^{(2)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(2)}$$

$$M_{xyxy} = -2M_{du}^{(2)} + 2M_{gu}^{(1)} - M_g^{(1)} + M_s^{(2)}$$

\* Rank 4 tensor (ssa).

$$\begin{bmatrix} 0 & M_{xxyy} & M_{xxzz} & 0 & M_{xxzx} & 0 \\ -M_{xxyy} & 0 & M_{yyzz} & 0 & M_{yyzx} & 0 \\ -M_{xxzz} & -M_{yyzz} & 0 & 0 & M_{zzzx} & 0 \\ 0 & 0 & 0 & 0 & 0 & M_{yzxy} \\ -M_{xxzx} & -M_{yyzx} & -M_{zzzx} & 0 & 0 & 0 \\ 0 & 0 & 0 & -M_{yzxy} & 0 & 0 \end{bmatrix}$$

$$M_{xxyy} = -2M_{dv}^{(3)} + 4T_{f3}^{(1)}$$

$$M_{xxzz} = 3M_{du}^{(3)} - M_{dv}^{(3)} - 4T_{f3}^{(1)}$$

$$M_{xxzx} = M_{dxz}^{(3)} + 2T_{fay}^{(1)} + 2T_{fbay}^{(1)} - 2T_{py}^{(1)}$$

$$M_{yyzz} = 3M_{du}^{(3)} + M_{dv}^{(3)} + 4T_{f3}^{(1)}$$

$$M_{yyzx} = M_{dxz}^{(3)} - 4T_{fbay}^{(1)}$$

$$M_{zzzx} = M_{dxz}^{(3)} - 2T_{fay}^{(1)} + 2T_{fbay}^{(1)} + 2T_{py}^{(1)}$$

$$M_{yzxy} = 4T_{fay}^{(1)} + T_{py}^{(1)}$$

\* Rank 4 tensor (aas).

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

$$M_{yzyz} = -2M_{du}^{(4)} + 2M_{dv}^{(4)} + M_s^{(3)}$$

$$M_{yzxy} = 2M_{dxz}^{(4)}$$

$$M_{zxzx} = -2M_{du}^{(4)} - 2M_{dv}^{(4)} + M_s^{(3)}$$

$$M_{xyxy} = 4M_{du}^{(4)} + M_s^{(3)}$$

\* Rank 4 tensor (aaa).

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

$$M_{yzxy} = T_{py}^{(2)}$$

\* Rank 4 tensor (sa).

$$\begin{bmatrix} 0 & M_{xxzx} & 0 \\ 0 & M_{yyzx} & 0 \\ 0 & M_{zzzx} & 0 \\ M_{yzyz} & 0 & M_{yzxy} \\ 0 & M_{zxzx} & 0 \\ M_{xyyz} & 0 & M_{xyxy} \end{bmatrix}$$

$$M_{xxzx} = 2M_{dxz}^{(5)} - T_{fay}^{(2)} - T_{fbx}^{(2)} + T_{py}^{(3)}$$

$$M_{yyzx} = 2T_{fay}^{(2)} + T_{py}^{(3)} + 2T_{py}^{(4)}$$

$$M_{zzzx} = -2M_{dxz}^{(5)} - T_{fay}^{(2)} + T_{fbx}^{(2)} + T_{py}^{(3)}$$

$$M_{yzyz} = -3M_{du}^{(5)} - M_{dv}^{(5)} + T_{f3}^{(2)}$$

$$M_{yzxy} = M_{dxz}^{(5)} - T_{fay}^{(2)} + T_{fbx}^{(2)} + T_{py}^{(4)}$$

$$M_{zxzx} = 3M_{du}^{(5)} - M_{dv}^{(5)} + T_{f3}^{(2)}$$

$$M_{xyyz} = -M_{dxz}^{(5)} - T_{fay}^{(2)} - T_{fbx}^{(2)} + T_{py}^{(4)}$$

$$M_{xyxy} = 2M_{dv}^{(5)} + T_{f3}^{(2)}$$

\* Rank 4 tensor (as).

$$\begin{bmatrix} 0 & 0 & 0 & M_{yzyz} & 0 & M_{yzxy} \\ M_{zxxx} & M_{zxyy} & M_{zxzz} & 0 & M_{zxzx} & 0 \\ 0 & 0 & 0 & M_{xyyz} & 0 & M_{xyxy} \end{bmatrix}$$

$$M_{yzyz} = -3M_{du}^{(6)} - M_{dv}^{(6)} + T_{f3}^{(3)}$$

$$M_{yzxy} = -M_{dxz}^{(6)} - T_{fay}^{(3)} - T_{fbx}^{(3)} + T_{py}^{(6)}$$

$$M_{zxzx} = 2M_{dxz}^{(6)} - T_{fay}^{(3)} - T_{fbx}^{(3)} + T_{py}^{(5)}$$

$$M_{zxyy} = 2T_{fay}^{(3)} + T_{py}^{(5)} + 2T_{py}^{(6)}$$

$$M_{zxzz} = -2M_{dxz}^{(6)} - T_{fay}^{(3)} + T_{fbx}^{(3)} + T_{py}^{(5)}$$

$$M_{zxzx} = 3M_{du}^{(6)} - M_{dv}^{(6)} + T_{f3}^{(3)}$$

$$M_{xyyz} = M_{dxz}^{(6)} - T_{fay}^{(3)} + T_{fbx}^{(3)} + T_{py}^{(6)}$$

$$M_{xyxy} = 2M_{dv}^{(6)} + T_{f3}^{(3)}$$

\* Rank 4 tensor (s).

$$\begin{bmatrix} M_{zxxx} & M_{zxyy} & M_{zxzz} & 0 & M_{zxzx} & 0 & 0 & M_{xxzx} & 0 \\ M_{yyxx} & M_{yyyy} & M_{yyzz} & 0 & M_{yyzx} & 0 & 0 & M_{yyxz} & 0 \\ M_{zzxx} & M_{zzyy} & M_{zzzz} & 0 & M_{zzzx} & 0 & 0 & M_{zzxz} & 0 \\ 0 & 0 & 0 & M_{yzyz} & 0 & M_{yzxy} & M_{yzyy} & 0 & M_{yzyx} \\ M_{zxxx} & M_{zxyy} & M_{zxzz} & 0 & M_{zxzx} & 0 & 0 & M_{zxzx} & 0 \\ 0 & 0 & 0 & M_{xyyz} & 0 & M_{xyxy} & M_{xyzy} & 0 & M_{xyyx} \end{bmatrix}$$

$$\begin{aligned}
M_{xxxx} &= -2M_{du}^{(1)} - 4M_{du}^{(2)} + 2M_{dv}^{(1)} + 4M_{dv}^{(2)} - M_{gu}^{(1)} + M_{gv}^{(1)} + 2M_g^{(1)} + M_s^{(1)} + 2M_s^{(2)} \\
M_{xxyy} &= -2M_{du}^{(1)} - 2M_{dv}^{(3)} + 2M_{gu}^{(1)} - M_g^{(1)} + M_s^{(1)} + 4T_{f3}^{(1)} \\
M_{xxzz} &= M_{du}^{(1)} + 3M_{du}^{(3)} + M_{dv}^{(1)} - M_{dv}^{(3)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)} - 4T_{f3}^{(1)} \\
M_{xxzx} &= M_{dxz}^{(1)} + 2M_{dxx}^{(2)} + M_{dzz}^{(3)} + 2M_{dxz}^{(5)} - M_{gay}^{(1)} - M_{gby}^{(1)} + 2T_{fay}^{(1)} - T_{fay}^{(2)} + 2T_{fb}^{(1)} - T_{fb}^{(2)} - 2T_{py}^{(1)} + T_{py}^{(3)} \\
M_{xxxz} &= M_{dxz}^{(1)} + 2M_{dxx}^{(2)} + M_{dzz}^{(3)} - 2M_{dxz}^{(5)} - M_{gay}^{(1)} - M_{gby}^{(1)} + 2T_{fay}^{(1)} + T_{fay}^{(2)} + 2T_{fb}^{(1)} + T_{fb}^{(2)} - 2T_{py}^{(1)} - T_{py}^{(3)} \\
M_{yyxx} &= -2M_{du}^{(1)} + 2M_{dv}^{(3)} + 2M_{gu}^{(1)} - M_g^{(1)} + M_s^{(1)} - 4T_{f3}^{(1)} \\
M_{yyyy} &= -2M_{du}^{(1)} - 4M_{du}^{(2)} - 2M_{dv}^{(1)} - 4M_{dv}^{(2)} - M_{gu}^{(1)} - M_{gv}^{(1)} + 2M_g^{(1)} + M_s^{(1)} + 2M_s^{(2)} \\
M_{yyzz} &= M_{du}^{(1)} + 3M_{du}^{(3)} - M_{dv}^{(1)} + M_{dv}^{(3)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)} + 4T_{f3}^{(1)} \\
M_{yyzx} &= M_{dxz}^{(1)} + M_{dxx}^{(3)} + 2M_{gby}^{(1)} + 2T_{fay}^{(2)} - 4T_{fb}^{(1)} + T_{py}^{(3)} + 2T_{py}^{(4)} \\
M_{yyxz} &= M_{dxz}^{(1)} + M_{dxx}^{(3)} + 2M_{gby}^{(1)} - 2T_{fay}^{(2)} - 4T_{fb}^{(1)} - T_{py}^{(3)} - 2T_{py}^{(4)} \\
M_{zzxx} &= M_{du}^{(1)} - 3M_{du}^{(3)} + M_{dv}^{(1)} + M_{dv}^{(3)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)} + 4T_{f3}^{(1)} \\
M_{zzyy} &= M_{du}^{(1)} - 3M_{du}^{(3)} - M_{dv}^{(1)} - M_{dv}^{(3)} - M_{gu}^{(1)} + M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)} - 4T_{f3}^{(1)} \\
M_{zzzz} &= 4M_{du}^{(1)} + 8M_{du}^{(2)} + 2M_{gu}^{(1)} + 2M_g^{(1)} + M_s^{(1)} + 2M_s^{(2)} \\
M_{zzzx} &= M_{dxz}^{(1)} + 2M_{dxx}^{(2)} + M_{dzz}^{(3)} - 2M_{dxz}^{(5)} + M_{gay}^{(1)} - M_{gby}^{(1)} - 2T_{fay}^{(1)} - T_{fay}^{(2)} + 2T_{fb}^{(1)} + T_{fb}^{(2)} + 2T_{py}^{(1)} + T_{py}^{(3)} \\
M_{zzxz} &= M_{dxz}^{(1)} + 2M_{dxx}^{(2)} + M_{dzz}^{(3)} + 2M_{dxz}^{(5)} + M_{gay}^{(1)} - M_{gby}^{(1)} - 2T_{fay}^{(1)} + T_{fay}^{(2)} + 2T_{fb}^{(1)} - T_{fb}^{(2)} + 2T_{py}^{(1)} - T_{py}^{(3)} \\
M_{yzyz} &= M_{du}^{(2)} - 3M_{du}^{(5)} - M_{dv}^{(2)} - M_{dv}^{(5)} - M_{gu}^{(1)} + M_{gv}^{(1)} - M_g^{(1)} + M_s^{(2)} + T_{f3}^{(2)} \\
M_{yzxy} &= M_{dxz}^{(2)} + M_{dxx}^{(5)} + 2M_{gby}^{(1)} + 4T_{fay}^{(1)} - T_{fay}^{(2)} + T_{fb}^{(2)} + T_{py}^{(1)} + T_{py}^{(4)} \\
M_{yzzy} &= M_{du}^{(2)} + 3M_{du}^{(5)} - M_{dv}^{(2)} + M_{dv}^{(5)} - M_{gu}^{(1)} + M_{gv}^{(1)} - M_g^{(1)} + M_s^{(2)} - T_{f3}^{(2)} \\
M_{zyyx} &= M_{dxz}^{(2)} - M_{dxz}^{(5)} + 2M_{gby}^{(1)} + 4T_{fay}^{(1)} + T_{fay}^{(2)} - T_{fb}^{(2)} + T_{py}^{(1)} - T_{py}^{(4)} \\
M_{zxxx} &= M_{dxz}^{(1)} + 2M_{dxx}^{(2)} - M_{dzz}^{(3)} - M_{gay}^{(1)} - M_{gby}^{(1)} - 2T_{fay}^{(1)} - 2T_{fb}^{(1)} + 2T_{py}^{(1)} \\
M_{zxyy} &= M_{dxz}^{(1)} - M_{dxx}^{(3)} + 2M_{gby}^{(1)} + 4T_{f3}^{(1)} \\
M_{zxxx} &= M_{dxz}^{(1)} + 2M_{dxx}^{(2)} - M_{dzz}^{(3)} + M_{gay}^{(1)} - M_{gby}^{(1)} + 2T_{fay}^{(1)} - 2T_{fb}^{(1)} - 2T_{py}^{(1)} \\
M_{zxxz} &= M_{du}^{(2)} + 3M_{du}^{(5)} + M_{dv}^{(2)} - M_{dv}^{(5)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(2)} + T_{f3}^{(2)} \\
M_{zxxz} &= M_{du}^{(2)} - 3M_{du}^{(5)} + M_{dv}^{(2)} + M_{dv}^{(5)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(2)} - T_{f3}^{(2)} \\
M_{xyyz} &= M_{dxz}^{(2)} - M_{dxx}^{(5)} + 2M_{gby}^{(1)} - 4T_{fay}^{(1)} - T_{fay}^{(2)} - T_{fb}^{(2)} - T_{py}^{(1)} + T_{py}^{(4)} \\
M_{xyxy} &= -2M_{du}^{(2)} + 2M_{dv}^{(5)} + 2M_{gu}^{(1)} - M_g^{(1)} + M_s^{(2)} + T_{f3}^{(2)} \\
M_{xyzy} &= M_{dxz}^{(2)} + M_{dxx}^{(5)} + 2M_{gby}^{(1)} - 4T_{fay}^{(1)} + T_{fay}^{(2)} + T_{fb}^{(2)} - T_{py}^{(1)} - T_{py}^{(4)} \\
M_{xyyx} &= -2M_{du}^{(2)} - 2M_{dv}^{(5)} + 2M_{gu}^{(1)} - M_g^{(1)} + M_s^{(2)} - T_{f3}^{(2)}
\end{aligned}$$

\* Rank 4 tensor (a).

$$\begin{bmatrix}
0 & 0 & 0 & M_{yzyz} & 0 & M_{yzxy} & M_{yzyy} & 0 & M_{zyyx} \\
M_{zxxx} & M_{zxyy} & M_{zxzz} & 0 & M_{zxxz} & 0 & 0 & M_{zxxz} & 0 \\
0 & 0 & 0 & M_{xyyz} & 0 & M_{xyxy} & M_{xyzy} & 0 & M_{xyyx}
\end{bmatrix}$$

$$M_{yzyz} = -2M_{du}^{(4)} - 3M_{du}^{(6)} + 2M_{dv}^{(4)} - M_{dv}^{(6)} + M_s^{(3)} + T_{f3}^{(3)}$$

$$M_{yzxy} = 2M_{dxz}^{(4)} - M_{dxz}^{(6)} - T_{fay}^{(3)} - T_{fbg}^{(3)} + T_{py}^{(2)} + T_{py}^{(6)}$$

$$M_{yzzz} = 2M_{du}^{(4)} - 3M_{du}^{(6)} - 2M_{dv}^{(4)} - M_{dv}^{(6)} - M_s^{(3)} + T_{f3}^{(3)}$$

$$M_{yzyx} = -2M_{dxz}^{(4)} - M_{dxz}^{(6)} - T_{fay}^{(3)} - T_{fbg}^{(3)} - T_{py}^{(2)} + T_{py}^{(6)}$$

$$M_{zxzx} = 2M_{dxz}^{(6)} - T_{fay}^{(3)} - T_{fbg}^{(3)} + T_{py}^{(5)}$$

$$M_{zxyy} = 2T_{fay}^{(3)} + T_{py}^{(5)} + 2T_{py}^{(6)}$$

$$M_{zxzz} = -2M_{dxz}^{(6)} - T_{fay}^{(3)} + T_{fbg}^{(3)} + T_{py}^{(5)}$$

$$M_{zxzx} = -2M_{du}^{(4)} + 3M_{du}^{(6)} - 2M_{dv}^{(4)} - M_{dv}^{(6)} + M_s^{(3)} + T_{f3}^{(3)}$$

$$M_{zxzx} = 2M_{du}^{(4)} + 3M_{du}^{(6)} + 2M_{dv}^{(4)} - M_{dv}^{(6)} - M_s^{(3)} + T_{f3}^{(3)}$$

$$M_{xyyz} = 2M_{dxz}^{(4)} + M_{dxz}^{(6)} - T_{fay}^{(3)} + T_{fbg}^{(3)} - T_{py}^{(2)} + T_{py}^{(6)}$$

$$M_{xyxy} = 4M_{du}^{(4)} + 2M_{dv}^{(6)} + M_s^{(3)} + T_{f3}^{(3)}$$

$$M_{xyzy} = -2M_{dxz}^{(4)} + M_{dxz}^{(6)} - T_{fay}^{(3)} + T_{fbg}^{(3)} + T_{py}^{(2)} + T_{py}^{(6)}$$

$$M_{xyyx} = -4M_{du}^{(4)} + 2M_{dv}^{(6)} - M_s^{(3)} + T_{f3}^{(3)}$$

\* Rank 4 tensor (t).

$$\begin{bmatrix} M_{xxxx} & 0 & M_{xxxx} \\ 0 & M_{yyyy} & 0 \\ M_{zzzz} & 0 & M_{zzzz} \\ M_{yyzz} & 0 & M_{yyzz} \\ M_{zzxx} & 0 & M_{zzxx} \\ 0 & M_{xxyy} & 0 \\ 0 & M_{yzyy} & 0 \\ M_{zxxx} & 0 & M_{zxxx} \\ M_{xxyy} + M_{yyzz} - M_{yzyy} - M_{zzxx} + M_{zxxx} & 0 & M_{xxyy} \\ 0 & M_{xyyz} + \frac{M_{zxxx}}{2} - \frac{M_{zxxx}}{2} & 0 \end{bmatrix}$$

$$M_{xxxx} = -2M_{du}^{(1)} - 4M_{du}^{(2)} + 2M_{dv}^{(1)} + 4M_{dv}^{(2)} - M_{gu}^{(1)} + M_{gv}^{(1)} + 2M_g^{(1)} + 3M_s^{(1)}$$

$$M_{xxxx} = M_{dxz}^{(1)} + 2M_{dxz}^{(2)} + M_{dxz}^{(3)} - 2M_{dxz}^{(5)} - M_{gay}^{(1)} - M_{gbg}^{(1)}$$

$$M_{yyyy} = -2M_{du}^{(1)} - 4M_{du}^{(2)} - 2M_{dv}^{(1)} - 4M_{dv}^{(2)} - M_{gu}^{(1)} - M_{gv}^{(1)} + 2M_g^{(1)} + 3M_s^{(1)}$$

$$M_{zzzz} = M_{dxz}^{(1)} + 2M_{dxz}^{(2)} + M_{dxz}^{(3)} - 2M_{dxz}^{(5)} + M_{gay}^{(1)} - M_{gbg}^{(1)}$$

$$M_{zzzz} = 4M_{du}^{(1)} + 8M_{du}^{(2)} + 2M_{gu}^{(1)} + 2M_g^{(1)} + 3M_s^{(1)}$$

$$M_{yyzz} = M_{dxz}^{(1)} + M_{dxz}^{(3)} + 2M_{gbg}^{(1)}$$

$$M_{yyzz} = M_{du}^{(1)} + 3M_{du}^{(3)} - M_{dv}^{(1)} + M_{dv}^{(3)} - M_{gu}^{(1)} + M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)}$$

$$M_{zzxx} = M_{du}^{(1)} - 3M_{du}^{(3)} + M_{dv}^{(1)} + M_{dv}^{(3)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)}$$

$$M_{zzxx} = M_{dxz}^{(1)} + 2M_{dxz}^{(2)} + M_{dxz}^{(3)} + 2M_{dxz}^{(5)} + M_{gay}^{(1)} - M_{gbg}^{(1)}$$

$$M_{xxyy} = -2M_{du}^{(1)} - 2M_{dv}^{(3)} + 2M_{gu}^{(1)} - M_g^{(1)} + M_s^{(1)}$$

$$M_{yzyy} = M_{du}^{(2)} + 3M_{du}^{(5)} - M_{dv}^{(2)} + M_{dv}^{(5)} - M_{gu}^{(1)} + M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)}$$

$$M_{zxxx} = M_{dxz}^{(1)} + 2M_{dxz}^{(2)} - M_{dxz}^{(3)} - M_{gay}^{(1)} - M_{gbg}^{(1)}$$

$$M_{zxxx} = M_{du}^{(2)} - 3M_{du}^{(5)} + M_{dv}^{(2)} + M_{dv}^{(5)} - M_{gu}^{(1)} - M_{gv}^{(1)} - M_g^{(1)} + M_s^{(1)}$$

$$M_{xyyz} = M_{dxz}^{(2)} - M_{dxz}^{(5)} + 2M_{gbg}^{(1)}$$