

MPG No. 32.1.118  $m\bar{3}m$  [ Type I, cubic ] [Q tensor]

\* Rank 0 tensor.

$$[Q]$$

$$Q = Q_s^{(1)}$$

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

$$\begin{bmatrix} Q_{xx} & 0 & 0 \\ 0 & Q_{xx} & 0 \\ 0 & 0 & Q_{xx} \end{bmatrix}$$

$$Q_{xx} = Q_s^{(1)}$$

\* Rank 2 tensor (a). \* Rank 3 tensor (s). \* Rank 3 tensor (a). \* Rank 4 tensor (sss).

$$\begin{bmatrix} Q_{xxxx} & Q_{xxyy} & Q_{xxyy} & 0 & 0 & 0 \\ Q_{xxyy} & Q_{xxxx} & Q_{xxyy} & 0 & 0 & 0 \\ Q_{xxyy} & Q_{xxyy} & Q_{xxxx} & 0 & 0 & 0 \\ 0 & 0 & 0 & Q_{yzyz} & 0 & 0 \\ 0 & 0 & 0 & 0 & Q_{yzyz} & 0 \\ 0 & 0 & 0 & 0 & 0 & Q_{yzyz} \end{bmatrix}$$

$$Q_{xxxx} = 2Q_g^{(1)} + Q_s^{(1)} + 2Q_s^{(2)}$$

$$Q_{xxyy} = -Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{yzyz} = -Q_g^{(1)} + Q_s^{(2)}$$

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

$$\begin{bmatrix} Q_{yzyz} & 0 & 0 \\ 0 & Q_{yzyz} & 0 \\ 0 & 0 & Q_{yzyz} \end{bmatrix}$$

$$Q_{yzyz} = Q_s^{(3)}$$

\* Rank 4 tensor (aaa). \* Rank 4 tensor (sa). \* Rank 4 tensor (as). \* Rank 4 tensor (s).

$$\begin{bmatrix} Q_{xxxx} & Q_{xxyy} & Q_{xxyy} & 0 & 0 & 0 & 0 & 0 & 0 \\ Q_{xxyy} & Q_{xxxx} & Q_{xxyy} & 0 & 0 & 0 & 0 & 0 & 0 \\ Q_{xxyy} & Q_{xxyy} & Q_{xxxx} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & Q_{yzyz} & 0 & 0 & Q_{yzyz} & 0 & 0 \\ 0 & 0 & 0 & 0 & Q_{yzyz} & 0 & 0 & Q_{yzyz} & 0 \\ 0 & 0 & 0 & 0 & 0 & Q_{yzyz} & 0 & 0 & Q_{yzyz} \end{bmatrix}$$

$$Q_{xxxx} = 2Q_g^{(1)} + Q_s^{(1)} + 2Q_s^{(2)}$$

$$Q_{xxyy} = -Q_g^{(1)} + Q_s^{(1)}$$

$$Q_{yzyz} = -Q_g^{(1)} + Q_s^{(2)}$$

\* Rank 4 tensor (a).

$$\begin{bmatrix} 0 & 0 & 0 & Q_{yzyz} & 0 & 0 & -Q_{yzyz} & 0 & 0 \\ 0 & 0 & 0 & 0 & Q_{yzyz} & 0 & 0 & -Q_{yzyz} & 0 \\ 0 & 0 & 0 & 0 & 0 & Q_{yzyz} & 0 & 0 & -Q_{yzyz} \end{bmatrix}$$

$$Q_{yzyz} = Q_s^{(3)}$$

\* Rank 4 tensor ( $t$ ).

$$\begin{bmatrix} Q_{xxxx} & 0 & 0 \\ 0 & Q_{xxxx} & 0 \\ 0 & 0 & Q_{xxxx} \\ 0 & 0 & Q_{yyzz} \\ Q_{yyzz} & 0 & 0 \\ 0 & Q_{yyzz} & 0 \\ 0 & Q_{yyzz} & 0 \\ 0 & 0 & Q_{yyzz} \\ Q_{yyzz} & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$Q_{xxxx} = 2Q_g^{(1)} + 3Q_s^{(1)}$$

$$Q_{yyzz} = -Q_g^{(1)} + Q_s^{(1)}$$