

Last part: decompose G_{eq} into irreps of C_{2v}

C_{2v}		I	C_2	σ_v	σ'_v
z, A_1		1	1	1	1
xy, A_2		1	1	-1	-1
x, B_1		1	-1	1	-1
y, B_2		1	-1	-1	1

C_{2v}	I	C_2	σ_v	σ'_v
G_{eq}	3	1	3	1

$$G_{eq} = a_1 A_1 + a_2 A_2 + a_3 B_1 + a_4 B_2$$

Decomposition formula

$$a_\alpha = \frac{1}{g} \sum_C N_C \chi_\alpha(C) [\chi_\alpha(C)]^*$$

$$g = 4, N_C = 1$$

$$a_1 = \frac{1}{4} (3 \times 1 + 1 \times 1 + 3 \times 1 + 1 \times 1) = 2$$

$$a_2 = \frac{1}{4} (3 \times 1 + 1 \times 1 - 3 \times 1 - 1 \times 1) = 0$$

$$a_3 = \frac{1}{4} (3 \times 1 - 1 \times 1 + 3 \times 1 - 1 \times 1) = 1$$

$$a_4 = \frac{1}{4} (3 \times 1 - 1 \times 1 - 3 \times 1 + 1 \times 1) = 0$$

$$G_{eq} = 2A_1 + B_1 \Rightarrow$$

Two vibrational modes with symmetry A_1 , one with symmetry B_1 , none with A_2 and B_2 .