

Problem set 4

1. Draw all the geometric isomers of $\text{Zr}(\text{acac})_4$ (square-antiprismatic). Which isomer do you think is most likely? Is optical isomerism possible?

2. Comment on the properties of ZrCl_4 (a white^[1] solid that sublimes^[2] at 300°C) and ZrCl_3 (a coloured^[3], involatile^[4] solid with low magnetic moment^[5] that has no aqueous chemistry^[6]). Both are octahedrally coordinated^[7] in the solid state.

[Hint: address each of the superscripted points]

3. Tantalum finds surgical use in bone repair and in the electronics industry in the manufacture of capacitors. Why?

4. The Mo-Mo distance in $[\text{Mo}_6\text{Cl}_8]^{4+}$ is shorter than the Nb-Nb distance in $[\text{Nb}_6\text{Cl}_{12}]^{2+}$. Account for this by calculating the M-M bond order in each case.

[Q from 2004 midterm]