

رابعة كيمياء عام (٤١٩ ك)
الشعبة : ك/ حيوى - ميكروبيولوجى /ك -
حيوان/ك - نبات/ك - جيولوجيا/ك

إعداد/ أ.د. أحمد الهداوى

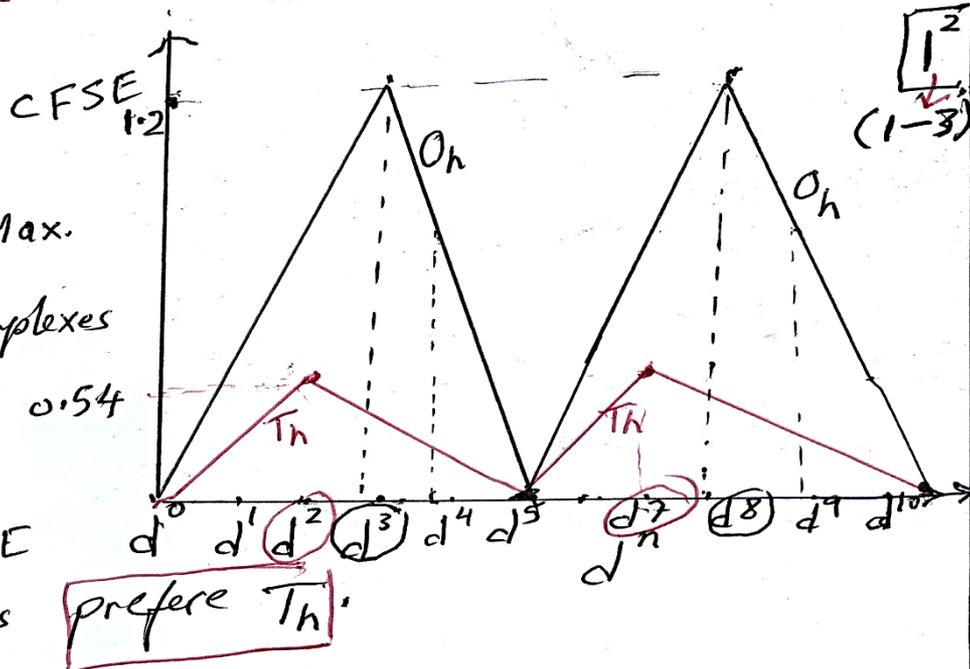
Factors Affecting Geometry of Complex Compounds (Octahedral or Tetrahedral Coordination)

P. 20-23

① Electronic Effect

- No. of d^n and CFSE
- d^3, d^8 prefer O_h for Max. CFSE
- eg; Cr(III) and Ni(II) complexes
- also d^4, d^9 : Mn(III) and Cu(II) complexes

- d^2, d^7 have max. CFSE
- V(III) & Co(II) complexes
- $[VCl_4]^-$, $Hg[Co(CNS)_4]$



prefer T_h

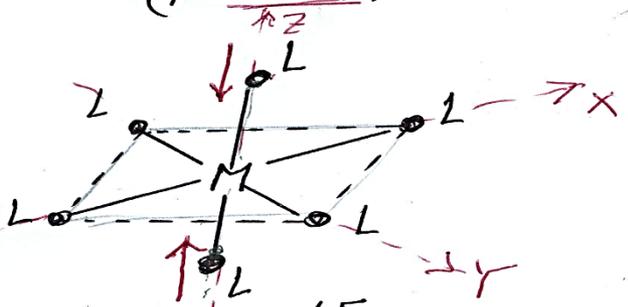
② Steric Effect

This concerns L-L ligand Repulsion forces

- I^- , Br^- ligands prefer T_h : Large size and negatively charged (High L-L Repulsion forces)
- H_2O, NH_3 ligands prefer O_h : Small size ligands (Small L-L Repul. forces)
- CN^- ligand forms O_h : strong Ligand - causes strong Ligand Field strong splitting - low spin Complexes - High CFSE.

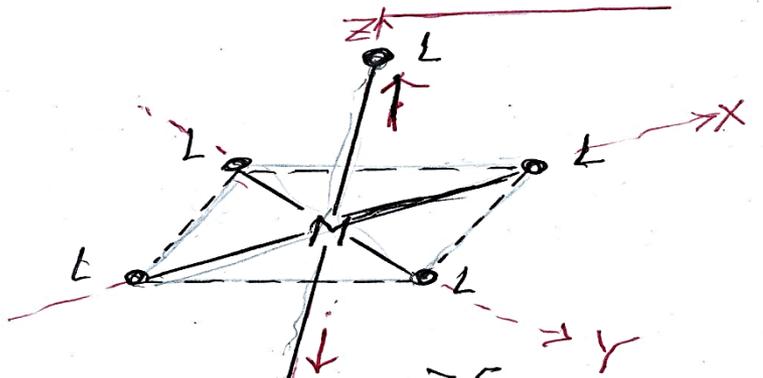
Distortion From Perfect O_h - Jahn-Teller Effect

(P. 23-25)



Compression Distortion

e.g; Ti(III) Complexes
($3d^1$)



Elongation Distortion
Cu(II) Complexes

($3d^9$)

2

Tetragonal Distortion for O_h d^9 (Cu(II) complexes)



$\Delta_{eg} \gg \Delta_{eg}$

* So, Large Distortion for $(eg)^{1,3}$ & Small Distortion for $(t2g)^{1,2,4,5}$.

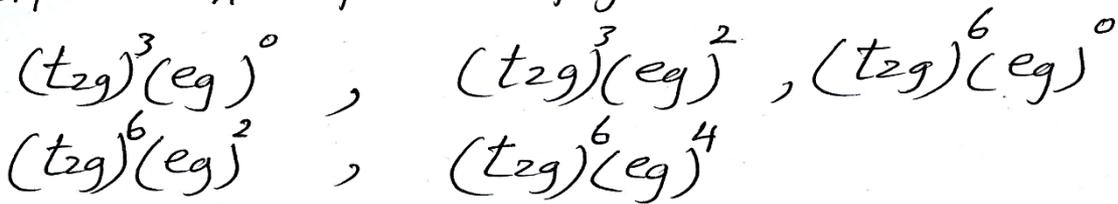


O_h

Tetragonal Distortion

2

- Perfect O_h for Configurations:



3²

* Jahn-Teller Theorem:

For a molecular system gives a degenerate electronic state, it will distort itself to split the degenerate state.

Exercise: Show the order of Distortion in the following complexes.

