

School of Chemistry

Aims and Objectives: Session 2017-2018

Module CH3514: Physical Inorganic Chemistry

Course Title: Physical Chemistry and Bonding of Transition Metals

Duration: 7 hours

Lecturer: Dr Eli Zysman-Colman

Aims: A continuation of the chemistry of the 3d transition metals with particular focus on the thermodynamics, bonding and kinetics of reactions.

Objectives:

1. A summary of how d-orbitals affect the properties of the transition metals.
2. To understand metal ion-ligand complexation equilibria; stepwise formation and overall stability constants. Relationship of β_{ML} to K_{ML} and ΔG°_{ML}
3. To understand the trends in β_{ML} across the period Sc – Zn and the Irving Williams maximum at Cu^{2+} due to Jahn-Teller effect at d^9
4. To understand how molecular orbital theory can be used to explain the properties of metal-ligand complexes
5. To understand the origins of the chelate effect – the increase in β_{ML} with chelate ligands. To appreciate and rationalise the entropic and enthalpic factors involved – trends across the period and the link to LFSE. To understand the mode of action of chelation therapy.
6. To appreciate that thermodynamic stability and kinetic lability are independent phenomena – not necessarily correlated. Equilibrium can be rapidly obtained irrespective of the size of K_{ML} .
7. To appreciate the range of labilities on 3d aqua metal ions and the correlation with LFSE. Definition of the terms inert and labile. Correlation of inertness with high LFAE – linked to LFSE.