

School of Chemistry

Aims and Objectives: Session 2023-2024, Semester 1

Module CH4514: Advanced Metal Chemistry

Course Title: Second and Third Row Transition Metals, Lanthanoids and Actinoids

Duration: 14 hours

Lecturer: Dr J. A. McNulty

Aims: This module is intended as an advanced coordination chemistry module and builds upon concepts explored in year 2 modules covering transition metals and coordination chemistry and also bonding and spectroscopy in transition metal complexes. This part of the course explores the lower reaches of the Periodic Table by investigating the chemistry of the 2nd and 3rd row d-block and f-block elements. The coverage of the 'heavier' metals seeks to compare and contrast the properties mentioned above e.g. chemical, spectroscopic and magnetic with those of their lighter counterparts e.g. the first transition series. At the end of the course students should be in a position to fully understand the chemistry of the heavier elements and rationalise the trends in chemical properties both down and across the Periodic Table.

Objectives:

- To understand and explain periodic trends across the *d*-block transition elements, including melting points, atomic and metallic radii and stabilities of oxidation states.
- To explain the electronic and photophysical properties of typical 4d and 5d metal complexes and describe some of the applications of 4d and 5d metal complexes in photoredox catalysis.
- To understand and explain the coordination chemistry of 4d and 5d metal complexes and how these differ to 3d metal complexes.
- To explain the physical properties, coordination chemistry and electronic configuration of the lanthanoids, including trends observed across the periodic table, term symbols, micro-states and the nature of absorption and emission.
- To explain the physical properties, coordination chemistry and electronic configuration of the actinoids, including their radioactive character, their absorption properties and trends observed across the periodic table.
- To understand and describe how the chemistry of the lanthanoids and actinoids can be exploited for specific applications.
- To understand and explain the coordination chemistry of lanthanoids and actinoids and how these differ to d-block metal complexes.