课程名（Coursename）

Inorganic I: Structure and bonding

课程代码（Coursenumber）

A1

课程对象（Audience）

Undergraduate

开课教师（Teacher）

Dr D. S. Wright and Dr P. T. Wood

学期（Semester）

M 1–5

课程描述（Description））

This course focuses on the availability (or otherwise) of valence d and f -orbitals in bonding,drawing on the structure and bonding across p-block, d-block and f -block elements. Thefirst six lectures focus on the synthesis, structures and bonding in a range of p-blockring systems, exemplified by borazine, phosphazene and thiazene (B/N, P/N and S/N)rings. Emphasis is placed on the bonding in these rings. Whilst p\_ 􀀀 p\_ bonding in borazines is generally accepted, the use of d orbitals in the bonding of P/N and some S/N rings is more contentious and the relative merits of p\_d\_ bonding vs more ionic perspectives are discussed. The second half of this course examines the transition metals and f -block elements. The more expanded nature of the 4d and 5d orbitals of the second and third row transition metals leads to significantly stronger covalency in bonding which is manifested in a greater prevalence for metal–metal as well as metal–ligand multiple bonding for the heavier elements. Whilst the lanthanide and actinides comprise almost a quarter of the periodic table, they receive comparatively little attention despite their intrinsically interesting properties and widespread applications. A comparison of the chemistry of the lanthanide and actinides reveals strongly differing behaviour which is attributed to the extent of f -orbital availability. Examples of predominantly ionic bonding in lanthanides and significant covalency in actinide complexes are presented.

Dr D. S. Wright: 6 lectures

Topics There are many thousands of compounds that fall into the category of inorganic rings. Rather than survey all of them, three types of N-containing ring system are introduced to exemplify concepts in synthesis, structure and reactivity of these rings: Synthesis, bonding and reactivity in borazines; the importance of p\_ 􀀀 p\_ bonding in inorganic rings. Substitution by addition elimination reactions; Synthesis, bonding and reactivity in phosphazenes; p\_ 􀀀 d\_ vs ionic approaches to bonding; gem and non-gem substitution patterns; Synthesis, bonding and reactivity of thiazene rings; stabilization of weak S/N bonds.

Dr P. T. Wood: 6 lectures

Topics A huge body of experimental data supports the more extensive participation of the d-orbitals in the bonding of the second and third row transition metals and for the increased participation of f -orbitals in bonding within the actinides. Selected examples are used to exemplify concepts in the bonding of d-block and f -block elements:

Metal–metal multiple bonding in the d-block.

Metal–ligand multiple bonding in d-block chemistry.

Ionic vs covalent bonding in the f -block.

Metal–ligand multiple bonding in f -block chemistry.

课时信息（Totalhours）

Courses A1–A4 are for one unit, courses A5 and A6 are for two units.

教参信息（Textbookinfo）

1 Principles and Applications of Density Functional Theory in Inorganic Chemistry I (Structure and Bonding) (Pt. 1) by Nik Kaltsoyanis and John E. McGrady (Hardcover - Nov. 10, 2004)

ISBN-13: 978-3540218609

世界各地拥有馆藏的图书馆（OCLC）:125

2 Recent Impact of Physics on Inorganic Chemistry (Structure and Bonding, Vol 21) by B. C. Tofield and B. Fricke (Hardcover - Aug. 1975)

ISBN-13: 978-0387071091

3 Inorganic Chemistry (Structure and Bonding) by Clarke (Hardcover - July 1981)

ISBN-13: 978-0387106557

4 Inorganic Chemistry. (Structure and Bonding) (Paperback - Mar. 2, 1972)

ISBN-13: 978-3540057000

5 Inorganic Chemistry. (Structure and Bonding) (English and German Edition) (Paperback - June 25, 1973)

ISBN-13: 978-3540061625

6 Recent Impact of Physics on Inorganic Chemistry (Structure and Bonding) (Hardcover - Aug. 19, 1975)

ISBN-13: 978-3540071099

7 Inorganic Chemistry (Structure and Bonding) (Hardcover - Sept. 30, 1981)

ISBN-13: 978-3540106555

8 Principles and Applications of Density Functional Theory in Inorganic Chemistry II (Structure and Bonding) (v. 2) by N. Kaltsoyannis and J.E. McGrady (Hardcover - Nov. 10, 2004)

ISBN-13: 978-3540218616

世界各地拥有馆藏的图书馆（OCLC）:125

9 Crystal Structure and Chemical Bonding in Inorganic Chemistry by C.J.M. Rooymans and A. Rabenau (Hardcover - Oct. 1975)

ISBN-13: 978-0720403404

10 Structure and Bonding in Crystalline Materials by Gregory S. Rohrer (Paperback - Aug. 2001)

ISBN-13: 978-0521663793

世界各地拥有馆藏的图书馆（OCLC）:210

11 Organometallic and Coordination Chemistry of the Actinides (Structure and Bonding) by Thomas E. Albrecht-Schmitt (Hardcover - Sept. 10, 2008)

ISBN-13: 978-3540778363

世界各地拥有馆藏的图书馆（OCLC）:110

12 Molecular Catalysis of Rare Earth Elements (Structure and Bonding) by Peter Roesky (Hardcover - Aug. 29, 2010)

ISBN-13: 978-3642128103

世界各地拥有馆藏的图书馆（OCLC）:17