南方科技大学 SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	**配位化学 Coordination Chemistry**
2.	授课院系 Originating Department	化学系 Department of Chemistry
3.	课程编号 Course Code	CH215
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业基础课 Major Foundational Courses
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	英文 English
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation& Contact （For team teaching, please list all instructors）	黄文忠，化学系（keithwongmc@sustech.edu.cn；88018311） Man-Chung Wong, Chemistry Department
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment （Optional）	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
学时数 Credit Hours	48				48

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	无机化学导论（CH213）
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	无机化学实验（CH204）、高等无机化学实验（CH319）
14.	其它要求修读本课程的学系 **Cross-listing Dept.**	

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

The objectives of this course included but not limited to the following:

To provide the knowledge of Coordination Chemistry, from the fundamental to Inorganic Photo-Physics and –chemistry.

教学目标如下：

获得从基础原理到无机光物理和光化学的配位化学知识。

16. **预达学习成果 Learning Outcomes**

To understand the bonding theories of Coordination Chemistry, including Valence Bond Theory, Crystal Field Theory and Ligand Field Theory; related to the Inorganic Photo-Physics and –chemistry.

To understand the basic Reactivity and Mechanism of Coordination Compounds.

明白配位化学的成键理论，包括价键理论，晶体场理论和配位场理论，涉及无机光物理和化学。

了解配位化合物的基本反应性和机理。

17. **课程内容及教学日历 （如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）**
Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Section 1 Introduction of Coordination Chemistry (10 hours)

- Background (1 hour)

Comparison of Coordination Chemistry with Organic Chemistry

- Werner Theory (1 hour)

Difference between original formulation with modern formulation

- Coordination Numbers (2 hour)

Relationship between coordination numbers with geometries

- Nomenclature (3 hours)

Naming of coordination compounds with various rules

- Structure and Isomerism (3 hours)

Structural or constitutional isomers including Hydrate isomers, Ionization isomers, Linkage isomers and Coordination isomers; and Stereo or configurational isomers including Diasteromers or geometric isomers and Enantiomers or optical isomers

Section 2 Bonding (12 hours)

- Valence bond theory (1 hour)

Structural relationship with different hybridization schemes

- Crystal field theory (5 hours)

  Octahedral crystal field

  Tetrahedral crystal field

  Square planar crystal field

Understanding of crystal field concept and stabilization energy in different geometries

- Ligand field theory (4 hours)

  Molecular orbitals from σ interactions

  π-interactions with π-donor ligand

  π-interactions with π-acceptor ligand

Understanding of ligand field concept by the interaction between ligand group orbitals and metal orbitals; comparison of crystal filed theory and ligand filed theory

Section 3 Electronic Spectra (12 hours)

- Background (1 hour)
- Microstates (1 hour)
- Russell-Saunders coupling (2 hours)
- Term symbols (1 hour)
- Identify the lowest-energy term (1 hour)
- Spin-orbit coupling (1 hour)
- Correlation diagrams (1 hour)
- Tanabe-Sugano diagrams (2 hours)
- Types of electronic transitions (1 hour)
- Jablonski diagram (1 hour)

Understand the limitation of one-electron consideration; consideration of electron-electron repulsion; introduction of Russell-Saunders coupling; assignment of Term symbols; introduction of spin-orbit coupling; correlation of energy between pure electron-electron repulsion and strong field extremes; introduction of types of electronic transitions including metal-centered transition, ligand-to-metal charge transfer (LMCT) transition, metal-to-ligand charge (MLCT) transition, ligand-to-ligand charge transfer (LLCT) transition; introduction of Jablonski diagram with consideration of various radiative and non-radiative decays

Section 4 Reactions and Mechanisms (10 hours)

- Background (1 hour)
- Kinetic vs. thermodynamic (1 hour)
- Classification of mechanisms (1 hour)
- Substitution reaction for square planar complexes (2 hours)
- Substitution reaction for octahedral complexes (2 hours)
- Oxidation-Reduction (Electron-Transfer) Reactions (2 hours)
  - Inner-sphere reaction
  - Outer-sphere reaction
- Photochemical reaction (2 hours)

Comparison between kinetic and thermodynamic considerations; classification of mechanisms including substitution reaction, electron transfer reaction and photochemical reaction; substitution reaction details including kinetic and thermodynamic considerations in square planar complexes; substitution reaction details including kinetic and thermodynamic considerations in octahedral planar complexes; associative and dissociative mechanisms

Section 5 Introduction to Bio-inorganic Chemistry and Applications (4 hours)

- Introduction to Bio-inorganic Chemistry (2 hours)
- Examples of applications of Coordination Compounds (2 hours)

Brief introduction of bio-inorganic chemistry including iron-oxygen bonding; providing application examples of coordination compounds including chemosensing, OLEDs and solar energy related examples

18. 教材及其它参考资料 Textbook and Supplementary Readings

Lecture handouts

Supplementary readings will be provided in the form of research journals

(1) Wiley-VCH 出版第六版的 Advanced Inorganic Chemistry（编著者：F. A. Cotton, G. Wilkinson, C. A. Murillo, M. Bochmann）

(2)培生公司 2011 年出版的 Inorganic Chemistry 第四版（编著者：G. L. Miessler 和 D. A. Tarr）

课程评估 ASSESSMENT

19.

评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance				
课堂表现 Class Performance				
小测验 Quiz		10		
课程项目 Projects				
平时作业 Assignments		10		
期中考试 Mid-Term Test				
期末考试 Final Exam		60		
期末报告 Final Presentation		20		

其它（可根据需要改写以上评估方式） **Others (The above may be modified as necessary)**				

20. 记分方式 **GRADING SYSTEM**

☑ A. 十三级等级制 **Letter Grading** ☐ B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. **本课程设置已经过以下责任人/委员会审议通过**
This Course has been approved by the following person or committee of authority

化学系教学指导委员会 Teaching committee of the chemistry department