高等无机化学 Advanced inorganic chemistry

- 教师介绍 Faculty

Jun LU（陆军）

Professor, PhD
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Research Field: Inorganic Materials Chemistry:

1. Optical and electric functionization of supramolecular intercalation assembly materials.
2. Design and construction of novel inorganic photocatalyts/ photoelectrocatalysts and their performance study.
3. Design and application study on novel inorganic/organic composite luminescence materials.
4. Design and performance study on novel inorganic photovoltaic/energy storage materials.

Education

September, 1994 – June, 1998:
University of Science and Technology of China, Bachelor in Science
September, 1998 – June, 2004:
University of Science and Technology of China, Ph.D. in Science

Work Experience

July, 2005 - June,2007: Postdoc
Department of Chemistry, Hongkong University
July, 2007 – December, 2010: Associate Professor
College of Science, Beijing University of Chemical Technology
January, 2011 – now: Professor
College of Science, Beijing University of Chemical Technology

Representative Publications

1. Jingjing Shi, Shuangde Li, Fengming Wang, Yanmei Li, Lina Gao, Xiaorang Zhang

and **Jun Lu***. **In situ topotactic fabrication of direct Z-scheme 2D/2DZnO/ZnxCd1−xS single crystal nanosheet heterojunction for efficient photocatalytic water splitting.** *Catal. Sci. Technol*, 2018, 8, 6458.

2. Ping Zhang, Yuehua Hu, Ruili Ma, Ling Li, and **Jun Lu***. **Enhanced Green Fluorescence Protein/Layered Double Hydroxides Composite Ultrathin film: Bio-hybrid Assembly and its Potential Application as a Fluorescent Biosensor**.*J. Mater. Chem. B*，2017, 5, 160.
3. Yumei Qin, Jingjing Shi, Xianggeng Gong, Zeyun Tian, Ping Zhang and **Jun Lu***.**A Luminescent Inorganic/Organic Composite Ultrathin Film Based on a 2D Cascade FRET Process and Its Potential VOC Selective Sensing Properties**. *Adv. Funct. Mater*. 2016, 26, 6752.
4. Shufang Zheng, **J. Lu*** X. Duan.**An inexpensive co-intercalated layered double hydroxide composite with electron donor-acceptor character for photoelectrochemical water splitting**.*Sci. Rep*, 2015, 5, 12170.
5. Zhen Li, **Jun Lu***, Yumei Qin, Shuangde Li and Shenghui Qin.**Two dimensional restriction-induced luminescence of tetraphenyl ethylene within the layered double hydroxide ultrathin films and its fluorescence resonance energy transfer**.*J. Mater. Chem. C*, 2013, 1, 5944
6. Zhen Li , **Jun Lu***, Shuangde Li , Shenghui Qin ,and Yumei Qin.**Orderly Ultrathin Films Based on Perylene/Poly(N -vinylcarbazole) Assembled with Layered Double Hydroxide Nanosheets: 2D Fluorescence Resonance Energy Transfer and Reversible Fluorescence Response for Volatile Organic Compounds**.*Adv. Mater*. 2012, 24, 6053.
7. Dongpeng Yan, **Jun Lu***, Min Wei,* David G. Evans, and Xue Duan.**Layered Host-Guest Materials with Reversible Piezochromic Luminescence**.*Angew. Chem. Int. Ed*. 2011, 50, 7037.
8. Dongpeng Yan, **Jun Lu***, Jing Ma, Min Wei*, David G. Evans, and Xue Duan. **Reversible Thermal Sensitive Fluorescent Ultrathin Film Based on Supra-mole cular Architectures**. *Angew. Chem. Int. Ed*. 2011, 50, 720.
9. Shuangde Li, **Jun Lu***, Min Wei, David G. Evans, Xue Duan.**Tris(8-hydroxyquinoline-5-sulfonate)aluminum Intercalated Mg − Al Layered Double Hydroxide with Blue Luminescence by Hydrothermal Synthesis**. *Adv. Funct. Mater*. 2010, 20, 2848.
10. Dongpeng Yan, **Jun Lu***, Min Wei*, Jingbin Han, Jing Ma, Feng Li, David G. Evans, and Xue Duan.**Poly(p-phenylene) Anionic Derivative/Layered Double Hydroxides Ordered Ultra Thin Films with Blue Luminescence by Layer-by-layer Assembly.** ***Angew***. *Chem. Int. Ed*. 2009, 48, 3073.

- **课程介绍 About Course**

This course is mostly established for foreign MS students and it will be taught in English. It is also applicable to those Chinese MS students who are eager to improve their international perspective, fundamental knowledge in current inorganic chemistry and communication skills in English. The objectives of this course are to help students understand the fundamental theories and knowledge of the current inorganic

chemsitry, i.e., molecular symmetry, coordination chemistry, organometallic chemistry, cluster chemistry, supramolecular chemistry, solid inorganic chemistry and bioinorganic chemistry and to train skills for analyzing, understanding and solving related science problems of current chemistry research. Furthermore, this course was aimed to broaden the science horizon of MS students to grasp the interdisciplinary and pan-molecular feature of current inorganic chemistry.

Outlines:

1. Introduction (2 hour)
2. Molecular symmetry and point groups(6 hour)
3. Coordination Chemistry (4 hours)
4. Organometallic Chemistry (8 hours)
5. Cluster chemistry (4 hours)
6. Supramolecular chemistry (8 hours)
7. Inorganic Solid State Chemistry (4 hours)
8. Bioinorganic chemistry (8 hours)

- **课程大纲 Syllabus**

Instructor: Jun Lu, Yufei Song Dr./Prof.

Course Code:

Hours: 48

Credits: 3.0

Prerequisites: General Chemistry, Inorganic Chemistry

Description: The objectives of this course are to help students understand the fundamental theories and knowledge of the fundamental theories and knowledge of the current inorganic chemsitry, molecular symmetry, coordination chemistry, organometallic chemistry, cluster chemistry, supramolecular chemistry, solid inorganic chemistry and bioinorganic chemistry and to train skills for analyzing, understanding and solving related science problems of current chemistry research.

Textbook: Gary L.Miessler, Donald ATarr,《Inorganic Chemistry》3rd Edition, Higher Education Press, China, 2006

References

1. F. Albert Cotton, Sir Geoffrey Wilkinson, *Advanced Inorganic Chemistry,* 3rd Edition, John Wiley & Sons, Inc. Germany, 1972 ;

2. Wai-Kee Li, Gong-Du Zhou, Thomas Mak Star *Advanced Structural Inorganic Chemistry*, Oxford University Press, USA, Inc. 2008;

3. R. John Errington, *Advanced Practical Inorganic and Metalorganic Chemistry*, Inc, 1997.

General Syllabus:

1. Introduction (2 hour)

Introduction of the history, current status, frontier and characteristics of inorganic chemistry; Recommend the related inorganic chemistry journals, and the teaching arrangements and the specific requirements.

2. Molecular symmetry and point groups (6 hour)

Description of the five kinds of independent symmetry operations and elements; The concepts of the point group and group, and their basic properties; Introduction of the simple application of group theory in inorganic chemistry.

3. Coordination Chemistry (4 hours)

The basic theory of coordination bonds, stereoisomerism, reaction mechanism and kinetics characteristics of coordination compounds; Some new functional coordination compounds.

4. Organometallic Chemistry (8 hours)

The basic concept, ligand types and bonding method of organometallic compounds; Effective atomic number rules(18 electronic rules) and applications; The structure, chemistry properties and applications of the typical organometallic compounds.

5. Cluster chemistry (4 hours)

Definition and structure features of atomic cluster compounds; Polyhedral skeletal electron-pair theory of borane structure; Types and characteristics of metal-metal bonds; Structure theory of the metal atom clusters; Properties and applications of various kinds of atomic cluster compounds.

6. Supramolecular chemistry (8 hours)

Basic concepts of supramolecular chemistry, molecular recognition, molecular assembly and molecular devices; Structures and properties of the three generations of organic host compounds; Supramolecular systems based on inorganic host compounds and typical molecular devices system.

7. Inorganic Solid State Chemistry (4 hours)

Basic concepts of point defect, chemical equilibrium of defect, non-stoichiometric compound and solid phase chemical reactions; Classification and features of point defect and basic types of the crystalline defect; Characteristics and mechanism of solid phase reaction.

8. Bioinorganic chemistry (8 hours)

Bioinorganic chemistry has made remarkable progress in recent years. On the basis of introducing the structure and properties of biological macromolecules and studying the physical and chemical methods of biological macromolecules, this chapter focuses on the metal enzymes and protein systems containing iron, zinc, copper, molybdenum and nickel and their simulation studies.

Grading: Project 20%; Homework 30%; Final exam 50%.

- **教案 Teaching Plan**

- 视频　　Video