Zhejiang Sci-Tech University

Research Master ' s Degree Program Outline

Chemistry

070300

The discipline of chemistry in Zhejiang Sci-Tech University has a history of approximately 80 years. As early as in 1927, silk reeling chemistry was set up. And in 1965, the Textile Chemistry Department was founded and teaching and scientific research was conducted in inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, and polymer chemistry. Undergraduate program for Fine chemical engineering and Applied chemistry were established in 1993 and 1999 respectively. In 2003, Applied chemistry was granted to confer the master ' s degree, then Organic chemistry, Polymer chemistry and physics in 2006. In 2008, Applied chemistry became one of the Key specialized subject of Zhejiang Province and was eligible for the assignment of professors later this year. In the same year, "Applied Chemistry and Ecological Dyeing and Finishing Project", the collaboration between chemistry and light-chemical engineering, was successfully acknowledged as the Priority Discipline in Zhejiang Province. In 2011, chemistry as the first discipline launched its graduate program, and doctoral degree was also authorized by textile material chemistry and physical as the secondary discipline that year. In 2012, polymer chemistry and physics was regarded as one of the Key Disciplines of Zhejiang Province.

Currently, the department has 42 faculty and staff members (30 with the doctoral degree) including 11 professors, 20 associate professors and 11 lecturers, among who 4 are doctoral tutors and 22 are master instructors. Presently, we have two Qianjiang Scholar Professors, two first-group " 151 Talents " of Zhejiang Province, two second-group " 151 Talents " of Zhejiang Province, five third-group " 151 Talents " of Zhejiang Province, and one University Innovation Team of Zhejiang Province. In the past five years, 92 graduate students have been enrolled in organic chemistry and polymer chemistry and physic. The number of graduate students who majored in applied photo chemistry and biomimetic synthesis of inorganic materials, which belong to applied chemistry, amounted to 143. And till now, 70 graduates have already obtained the Master ' s Degree.

After several years of development, we have formed the primary discipline of chemistry with distinctive features, excellent scientific research level, and comprehensive secondary disciplines, which have contributed to our distinguished disciplinary research standard both internally and on the global front. Polymer chemistry focuses on the effect of polymer material ' s property on its surface structural design and control. Physical chemistry carries out the research on condensed

state structure of large particles, dynamics and macroscopic chemical physical properties. Organic chemistry mainly takes the research on green organic chemistry. Inorganic chemistry is about the tuning of the structure and property of inorganic nanomaterials. Boasting with advanced scientific research conditions and sophisticated devices and processes for analysis and test (with laboratory instruments worth 25 million RMB), we have undertaken and accomplished more than 105 national and provincial projects with a total of 12.5 million RMB in funding. Among those projects, there is 1 National "973" Sub-project, 28 National Natural Science Foundation of China, 3 Zhejiang Provincial Natural Science Foundation and the Outstanding Youth Project, and 23 general programs. Our faculty have authored 187 papers in various domestic and international journals such as Chemical Reviews、Angew. Chem. Int. Ed.、Macromolecules、Langmuir、Journal of Physical Chemistry C、Organic Letters、Soft Matter, etc., and all of them can be searched in SCI and EI. Also, 25 authorized Chinese invention patents have been confirmed. In collaboration with the textile discipline, we have received two of the Second Prize of National Science and Technology Progress Awards, three of the Second Prize of Zhejiang Science and Technology Awards, two of the First Prize of Zhejiang Teaching Achievement Prize.

I. Objectives

Postgraduates of this discipline should adhere to the principle of all-round development of morality, intelligence and physique. Specific requirements include:

1. The students are required to grasp Marxism-Leninism, Mao Zedong Thought, and Deng Xiaoping ’ s Theory, love the motherland, and abide by the laws and regulations. Through rigorous learning and professional dedication, the students will strive to propel the modernization drive of China.

2. The students are required to grasp not only basic chemistry theory and skill, but also systematic and thorough expertise, become specialized in chemistry development direction and international research frontier. Proficiency in one foreign language and in modern information medium like computer is also a necessity. The graduates are supposed to be capable of conducting research and teaching in chemistry and related scientific fields, be competent for product development and management and independent expertise operation.

II. Research Areas

1.Polymer chemistry and physics

(1) Functional polymeric membrane. The separation performance of a membrane is controlled by its surface and bulk structure. We aim to built bridges between the structures of the

membrane and its separation performance, tailor the membrane surface structure to optimize the separation performance and also discuss the mass transfer process, and membrane surface reconstruction in separation. (2) Molecular design of polymer surface. The film surface structure is very important in the many applications involving surface and interface of polymers. We are interested in how the solid film surface structure forms by chain condensation from the polymer solution. By resorting some surface sensitive techniques, we explore the formation mechanisms of the polymer surface structures, including studies about the correlations between the solution properties and film surface structure, and the influence of the film formation method on the surface structure of polymer films. (3) Nano-composites. We carry out researches about the structures and dynamics of polymer chains at the nano-filler/polymer matrix interface, and to discuss the reinforcing mechanism of the nano-composites. (4) Bio-macromolecules materials. In this field, we study the effect of the surface structure and property of polymers on the bio-related applications of the polymer materials, involving the enzymatic activity, protein adsorption and biocompatibility et al. (5) Theoretical simulation of polymer structure and dynamic. The research interest of this aspect was to investigate the micro-structure and dynamic behavior of polymers chain at the film and solution surface using the molecular simulations approach such as monte carlo simulation, and molecular dynamics simulation.

2.Organic Chemistry

（1） Organic synthesis methodology: study on application of novel reagents and advanced technique in organic synthesis;(2) Natural products chemistry: study on methods for effective extraction and isolation of natural products; modification and determination of natural products; biosynthesis of natural products and control of their metabolism; (3)Synthesis of fine chemicals: study on development of fine chemicals and their application in commercial process; (4) Organic analysis: study on structures and constitutions of new materials based on advanced instruments along with traditionally chemical analysis.

3.Physical Chemistry

(1)Molecular Photochemical Reaction Dynamics. Time-resolved resonance Raman spectroscopy, time-dependent wave-packet theory, vibronic-coupling principle, quantum mechanical calculations have been used to investigate the fundamental scientific issues such as the molecular photodissociation, the molecular photoisomerization, the excited-state proton/electron-transfer reaction dynamics and the excited-state potential energy surface crossing and photochemical reaction mechanism. New research equipment, the resonance Raman spectrometer integrated with the matrix-isolation technique or fiber-optics, is being developed. (2)Material Chemistry and Physics as well as Theories on the Modulation of the material Structures and Properties. The first-principle quantum mechanical calculations on the basis of the

density functional theory, the molecular dynamics method, Monte Carlo method, the finite element method, etc., are used to investigate the fundamental issues in optics, electricity and magnetics of the functional materials.(3)Theoretical and Computational Chemistry. Mesoscopic modeling of the microstructures such as micropore, surface, and nano-particles, and new materials. Computational modeling of soft matters.(4)Catalysis and Surface Chemistry. Chemical Dispersion and surface chemistry of solid catalysts. Structure-acticity relationship. Synthesis, assembly and property of new catalytic materials. Industrial application of catalysts.(5)Physical Chemistry of Self-Assemble Membrane. Physical Chemistry of the assembly of the two-dimensional ordered molecular films with different functions. Physical Chemistry of the construction of supra-molecular aggregates and molecular devices with special function

4.Inorganic Chemistry

(1) Controlled synthesis, assembly and application of functional nano-materials: Controlled synthesis and assembly of nano-materials by using new synthetic methods, such as chemical synthesis, biomimetic synthesis and assembly synthesis. The application of nano-materials in energy, environmental protection, catalysis, textile, and so on, is explored. (2) Functional coordination complex: Based on molecular design, new molecular-based magnetic materials, conductive materials, and storage materials are explored.(3) Computer simulation on the morphological control and assembly of inorganic materials: Based on the experimental results, the self-assembly behavior of complex systems, containing solvents, copolymers and inorganic crystals with multi-scale and multi-degree of freedom, has been extensively simulated. The relationship among the property, structure and composition of new functional materials/composite materials is studied. New materials with specific functions are developed through molecular design and computer simulation.

5.Analytical Chemistry

(1) Bioanalysis and biosensing. Research work focuses on the development of new artificial interface for electrochemical sensing of important biological substances such as drug molecules, glucose, tumor markers, cell, bacteria and so on. (2) Separation science and hyphenated techniques. Research work focuses on three areas. The first aspect is the preparation of advanced chromatographic materials and their applications in protein chromatography. Novel organic-inorganic composite materials with specific functionality, high mechanical strength and stability are developed based on the hybridization of functional biopolymer with inorganic materials. The second aspect is the development of electrochemical detector for ion chromatography. The third aspect lies in the study on extraction, biological activity of active ingredients in plant and microbial organism. (3) Optical coherence tomography technology and its applications in biomedical research. Research work focuses on the characterization of chemical changes in blood coagulation,

erythrocyte aggregation and other rheological parameters using optical coherence tomography. Additionally, biomedical optical imaging and control of optical properties of biological tissue are also investigated.

III. Length of Study

The normal study length for full-time research postgraduates is 3 years. Students who finish their courses ahead of schedule and attain the standards of degree conferment can, after approval, apply for the degree at an earlier time (not earlier than 3 years), while the maximum length of schooling is 4 years.

IV. Credit Requirements

Students are required to take at least 34 credits, with a minimum of 21 credits of degree courses.

V. Curriculum

Course Classification		Course Code	Course Name	Hour/ Credit	Semester			Notes
					I	II	III	
Degree courses	General degree courses	FL10015	The Outline of China*	36/2	√			(Entirely in English)
		CC10009	Basic Chinese (I)	54/3	√			(For beginners of Chinese language among foreign graduate students)
		CC10010	Basic Chinese (II)	36/2		√		(For beginners of Chinese language among foreign graduate students)
		FL10026	English Writing of Academic Paper	16/1	√			
		IF10001	Education on China's National Conditions for International Students A	16/1	√			
	Major-related degree courses	SC11070	Spectral Data for Structure Determination of Organic Compounds*	48/3	√			
		SC11071	Modern Polymer Chemistry*	64/4	√			
		SC11072	Modern Polymer Physics*	48/3	√			
		SC11073	Modern characterization Technology*	48/3	√			
		SC11074	Advanced Physical Chemistry*	48/3	√			
		SC11075	Advanced Organic Synthesis*	48/3	√			
		SC11076	Advanced Analytical Chemitry*	48/3	√			
		SC11077	Advanced Inorganic Chemistry*	48/3	√			

		SC11068	Advanced Organic Chemistry C*	48/3	√			(Advanced Organic A & Advanced Organic C only choose one)	Compulsory; maximum course load: 1; minimum course load: 1; maximum credits: 3; minimum credits: 3;
		SC11069	Advanced Organic Chemistry A*	48/3	√			(Advanced Organic A & Advanced Organic C only choose one)	
Non-degree courses			All optional courses in the university curriculum are open to students of this program.						
Additional courses									For students without an equivalent bachelor ' s degree
Others		Academic Seminar		/1	separated				
		Academic Report		/1	separated				
		Practical Training			Students are required to take at least 2 weeks practical training, participate in at least one social investigation, and write relevant report. Normally the training should be completed in the first academic year.				
		Thesis Proposal			The 3rd semester				
		Thesis Writing			The 3rd-6th semester				

C=Compulsory, O=Optional

* Students can decide whether to take this optional course or not according to their different research area.

VI. Dissertation Requirement

1. Thesis is an essential part to develop graduates ' abilities to innovate, find out problems, analyze problems, and thereby solve problems.

2. With the guidance of the supervisor, postgraduate must choose the topic containing significant academic and application value. And thesis proposal is required to be finished in the third semester.

3. Thesis must be accomplished independently by postgraduates under the supervision of their instructors.

4. Thesis must be clearly stated and rigorously analyzed with reliable data and concise expression, and must comply with Thesis Specifications of Postgraduates of Zhejiang Sci-Tech University.

5. The thesis generally consists of the following:

(1)The significance of the topic, the research background at home and abroad;

(2)The problem to solve, the research method, technical skills and its feasibility;

(3)The data process, results analysis, conclusion and references.

6. The thesis is required to achieve the standard of publishing before the oral defense as scheduled.

VII. Teaching Format

1. The educational mode applies the integration of supervisor-responsible system and leading group instruction.

2. Postgraduates are required to formulate their own individual research plans under the principle of combining theory study and scientific research.

3. Teaching materials should reach to domestic and foreign advanced level.

4. Intermediate assessment will be carried out at the end of the course.

VIII. Graduation & Degree Conferment

The degree conferment must comply with The Regulations of Degree Conferment of Zhejiang Sci-Tech University; all postgraduates must reach the requirements of the training scheme. Only those who meet the above requirements and passed through the defense are conferred to the master ' s degree by the University Academic Degree Committee.

With the permission of the University Academic Defense Committee, those who fail to pass through the defense are allowed to revise and submit the application for academic oral defense within one year. After approval, the qualified candidates who pass through the defense will be conferred to the master ' s degree. Otherwise, they will only receive the diplomas. As for students

who fail to complete the course study or thesis writing, they will be regarded as undergraduates.

IX. References

1. The educational program should be earnestly implemented upon formulation. Examination and approval formalities shall be handled in accordance with certain alterations. This program will take effect on postgraduates enrolled in 2013.

2. Graduates should at least reach Level 3 required by Chinese Language Proficiency Scales for Speakers of Other Languages. That is, Graduates should pass the Chinese Proficiency Test (HSK) and obtain the Level 3 Certificate.

Signature of Program Director:

Signature of Director of School Academic Degree Committee:

Date: