

## 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 <b>Course Title</b>	高分子化学 <b>Polymer Chemistry</b>
2.	授课院系 <b>Originating Department</b>	化学系 Department of Chemistry
3.	课程编号 <b>Course Code</b>	CH315
4.	课程学分 <b>Credit Value</b>	3
5.	课程类别 <b>Course Type</b>	专业选修课 Major Elective Courses
6.	授课学期 <b>Semester</b>	秋季 Fall
7.	授课语言 <b>Teaching Language</b>	中英双语 English & Chinese
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) <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	何凤, 副教授, 化学系 第一科研楼 401 室 hef@sustech.edu.cn 0755-8801-8398  Feng He, Associate Professor, Chemistry Rm.401, No.1 Research Bldg. hef@sustech.edu.cn 0755-8801-8398
9.	实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	兰霞, 教学助理, 化学系 第一科研楼 417 室 lanxia08@163.com 18938971990  Xia Lan, Teaching Assistant, Chemistry Rm.417, No.1 Teaching Bldg. lanxia08@163.com 18938971990
10.	选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>	50

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	有机化学 II (CH206)
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	
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

高分子化学是由化学系开设，面向化学专业的选修课程。它介绍描述高分子科学的理论基础和重要课题。修完本课程，要求了解高分子材料的基本概念、结构与性质；聚合反应以及它们的机制和动力学，尤其是结构与性能的关系。

This course introduces the field of polymer science, offering a general overview of the concepts, structures and properties of these materials; polymerization reactions and their mechanisms and kinetics. The structure/property relationship is emphasized.

#### 16. 预达学习成果 Learning Outcomes

1、让学生了解高分子性质与表征的基础知识。

2、让学生掌握高分子聚合反应的机理与反应动力学的相关知识。

3、教导学生聚合物结构/性能之间关系，使他们能够进行简单的高分子预测设计。

1. To teach students with a basic knowledge of properties and characterizations of polymers.

2. To provide students with an elementary understanding of the reaction mechanisms involved in polymer synthesis and the kinetics of these reactions.

3. To teach students how the above materials are related, the fundamentals of polymer structure/property relationships, so that they can make simple predictions for design.

#### 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.)**

## 1. Basic Principles

Origins; Definitions and nomenclature; Classification of polymers and polymerization reactions; Structures; Molecular weight; Physical states. (Two weeks)

基本原则

起源；定义和命名；聚合物分类和聚合反应；结构；分子量；物理状态。（两星期）

## 2. Step Polymerization

Basic of step polymerization; Linear step polymerization - kinetics, molecular weight control; Non-linear step polymerization - crosslinking and gelation theory; Process conditions; Types of polymers; Dendrimers and hyperbranched polymers. (Three weeks)

逐步聚合

逐步进聚合的基本原理；线性逐步聚合 - 反应动力学；分子量控制；非线性逐步聚合 - 交联和凝胶理论；工艺处理条件；聚合物类型；树枝状化合物和超支化聚合物。（三星期）

## 3. Radical Polymerization

Chemistry of conventional free-radical polymerization; Initiation; Kinetics; Chain transfer; Inhibition and retardation; Determination of rate constants; Living radical polymerization. (Three weeks)

自由基聚合

常规自由基聚合化学反应；引发；动力学；链转移；阻聚和缓聚；速率常数测定；活性自由基聚合。（三星期）

## 4. Radical Copolymerization

General considerations; Copolymer composition; Effect of reaction conditions; Reactivity; Terminal model of radical copolymerization. (Two weeks)

自由基共聚

常规自由基共聚考量；共聚物组成；反应条件的影响；反应活性；自由基共聚反应的终止模式。（两星期）

## 5. Polymerization Process

Bulk polymerization; Solution polymerization; Suspension polymerization; Emulsion polymerization; Strategies for performing polymerization process. (One week)

聚合过程

本体聚合；溶液聚合；悬浮聚合；乳液聚合；聚合过程策略讨论。（一星期）

6. Ionic polymerization

Cationic polymerization; Anionic polymerization; Distinguishing between radical, cationic and anionic polymerizations; Ionic copolymerization. (Two weeks)

离子聚合

阳离子聚合；阴离子聚合；自由基、阳离子和阴离子聚合反应的特征区别；离子共聚合反应。（两星期）

7. Coordination Polymerization

Introduction to stereochemistry of polymerization; Geometric isomerism in polymers; Ziegler-Natta coordination polymerization; Metallocene coordination polymerization. (One week)

配位聚合

立体化学聚合介绍；聚合物空间几何异构；Ziegler-Natta 配位聚合反应；金属配位聚合反应。（一星期）

8. Ring-opening Polymerization

Thermodynamics and kinetics of ring-opening polymerization; Cationic ring-opening polymerization; Anionic ring-opening polymerization; Free-radical ring-opening polymerization; Ring-opening metathesis polymerization. (One week)

开环聚合

开环聚合的热力学和动力学特征；阳离子开环聚合；阴离子开环聚合；自由基开环聚合；开环歧化聚合。（一星期）

9. Reaction of polymers

Principles of polymer reactivity; Reactions of functional groups; Graft copolymerizations; Block copolymers; Degradation and aging. (One week)

聚合物反应

聚合物反应性原则；不同官能团的反应特性；接枝共聚反应；嵌段共聚物；降解和老化。（一星期）

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

Odian "Principles of Polymerization" 4th Ed.

Young "Introduction to Polymers" 3rd Ed.

潘祖仁 “高分子化学” 第五版.

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		5		
课堂表现 Class Performance		10		
小测验 Quiz		30		
课程项目 Projects				
平时作业 Assignments		25		
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation		30		
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