

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	晶体生长 Crystal Growth
2.	授课院系 Originating Department	材料科学与工程系 Department of Materials Science and Engineering
3.	课程编号 Course Code	MSE337
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业基础课 Major Foundational Course
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	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) Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	邬家臻助理教授 Assistant Prof. Jiazhen Wu 材料科学与工程系 Department of Materials Science and Engineering wujz@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	无 NA
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	无 NA

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	44	4			48
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	材料科学与工程基础 Fundamentals of Materials Science and Engineering				
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

晶体生长是物理、化学、材料等专业的重要基础课程。高品质晶体材料的制备是发现新材料、新功能和新应用的起点。课程讲授晶体生长的基础理论和实验知识。主要内容包括相平衡、成核、扩散、热动力学等晶体生长的基本现象和原理及气相生长、溶液生长、熔体生长等常见的实验方法。通过本课程的学习，学生将具备制定材料生长方案的能力，从而为进一步制备各种功能晶体材料并研究其本征性能打下坚实的基础。

“Crystal Growth” is an important major foundational course for Physics, Chemistry, Materials and other materials related specialties. The preparation of high-quality crystal materials is the starting point for discovery of new materials, new functions and new applications. This course provides basic theoretical and experimental knowledge of crystal growth. The main content includes the basic phenomena and principles of crystal growth, such as phase equilibrium, nucleation, diffusion, and related thermodynamics. The common experimental methods, such as the growth from the vapor phase, solution or the melt will be also introduced. By taking this course, undergraduates will be able to make plans for growth of materials, which they need for their own research.

16. 预达学习成果 Learning Outcomes

1. 掌握晶体生长的基本原理：包括相平衡，成核，原子扩散等；
2. 熟悉晶体生长的常用方法：如液相法，固相法，气相法等；
3. 熟悉晶体结构的基本表征方法及原理；
4. 掌握英文专业核心词汇，能够阅读相关英语专业文献；
5. 了解晶体生长在实际科学研究中的应用，并为实际的科研工作提供指导。

1. grasp the basic principles of crystal growth, including nucleation, atomic diffusion, phase equilibrium, etc.;
2. be familiar with the common methods for crystal growth, such as, the growth from liquid solutions, solid-state reaction routes and vapor phases;
3. be familiar with the basic crystal structure characterization methods and principles.
4. master the core vocabulary of crystal growth and be able to read English professional literatures.
5. understand the application of crystal growth in actual research work.

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.)

第一章：晶体材料简介（2学时）
第二章：平衡（4学时）
第三章：相图与晶体生长（4学时）
第四章：成核现象与外延简介（6学时）
第五章：生长机制（4学时）
第六章：气相生长（4学时）
第七章：溶液生长（4学时）
第八章：熔体生长（4学时）
第九章：固相生长（2学时）
第十章：杂质与缺陷（4学时）
第十一章：晶体结构分析基础（4学时）
第十二章：材料设计基础（2学时）
复习与讨论（4学时）

Chapter 1: Introduction to Crystalline Materials (4 credit hours)
Chapter 2: Equilibrium (4 credit hours)
Chapter 3: Phase Diagram and Crystal Growth (4 credit hours)
Chapter 4: Nucleation Phenomena and Epitaxy (4 credit hours)
Chapter 5: Growth Mechanism (4 credit hours)
Chapter 6: Growth from the Vapor Phase (4 credit hours)
Chapter 7: Growth from Solutions (4 credit hours)
Chapter 8: Growth from the Melt (4 credit hours)
Chapter 9: Solid-State Reaction Route (2 credit hours)
Chapter 10: Impurities and Defects (4 credit hours)
Chapter 11: Fundamentals of Crystal Structure Analysis (4 credit hours)
Chapter 12: Fundamentals of Materials Design (2 credit hours)
Note: There will be around 4 hours tutorials time included in this lecture.

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

1. 《Modern Crystallography III, Crystal Growth》 by A. A. Chemov
2. 《Crystal Growth for beginners: fundamentals of nucleation, Crystal Growth, and Epitaxy》 by Ivan Markov;
3. 《Crystal Growth in Science and Technology》, edited by H. Arend and J. Hulliger;
4. 《Kinetic Process: Crystal Growth, Diffusion, and Phase Transitions in Materials》, by K. A. Jackson

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		10		
课堂表现 Class Performance		10		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20		
期中考试 Mid-Term Test		20		
期末考试 Final Exam		40		
期末报告 Final Presentation				
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