

固体化学 Solid State Chemistry 课程教学大纲

Course Outline

课程基本信息 (Course Information)					
课程代码 (Course Code)	001-(2018-2019-1)CA344(教学班)	*学时 (Credit Hours)	32	*学分 (Credits)	2
*课程名称 (Course Title)	(中文) 固体化学				
	(英文) Solid State Chemistry				
*课程性质 (Course Type)	此课程是针对化学近缘理工科专业的本科专业课程。围绕固体及相关材料的合成与制备、结构及功能进行课程讲授，使学生了解和掌握固体及材料化学的基本原理以及相关的研究方法。				
授课对象 (Target Audience)	本科生				
*授课语言 (Language of Instruction)	汉语/英语				
*开课院系 (School)	致远学院				
先修课程 (Prerequisite)	无机化学、有机化学、分析化学、物理化学等基础课程				
授课教师 (Instructor)	李新昊	课程网址 (Course Webpage)			
*课程简介 (Description)	<p>课程性质：此课程是针对化学近缘理工科专业的本科专业课程。</p> <p>教学目标：围绕固体及相关材料的合成与制备、结构及功能进行课程讲授，使学生了解和掌握固体及材料化学的基本原理以及相关的研究方法。</p> <p>课程大纲</p> <p>简介 Precourse: General introduction (2 学时)</p> <p>第一章 Synthetic and Preparative Methods (4 学时)</p> <p>1.1 Ceramic method</p> <p>1.2 Sol-gel method</p> <p>1.3 Microwave synthesis</p> <p>1.4 Precursor methods</p> <p>1.5 Hydrothermal and Solvothermal methods</p> <p>1.6 Chemical vapor deposition (CVD)</p> <p>1.7 Chemical vapor transport</p> <p>1.8 Laser ablation</p> <p>1.9 Molten and Czochralski methods</p> <p>1.10 Arc discharge</p> <p>1.11 Electrochemical Preparation</p>				

1.12 High-pressure synthesis

第二章 Characterization methods for solid materials (4 学时)

2.1 X-ray diffraction techniques

2.2 X-ray absorption spectroscopy

2.3 X-ray and ultraviolet photoelectron spectroscopy (XPS and UPS)

2.4 Infrared and Raman spectroscopy

2.5 Nuclear magnetic resonance (NMR) and electron spin (paramagnetic) resonance (ESR or EPR) spectroscopy

2.6 Scanning tunneling microscopy (STM) and atomic force microscopy (AFM)

第三章 Electrically conducting materials (4 学时)

3.1 Ionic conductors

3.2 Metallic conductors

3.3 Semiconductors

3.4 Insulators

3.5 Semimetallic conductors

3.6 Superconductors

第四章 Magnetic and Dielectric Materials (4 学时)

4.1 diamagnetic materials

4.2 paramagnetic materials

4.3 ferromagnetic materials

4.4 ferrimagnetic materials

4.5 antiferromagnetic materials

第五章 Optical Properties of Solids (4 学时)

5.1 Phenomena of light through a medium

5.2 The interaction of light with atoms and molecules

5.3 Solid lasers

5.4 Optical fibers

5.5 Optical switches

5.6 Nonlinear optical properties of solids

第六章 Microporous and Mesoporous Materials (4 学时)

6.1 Microporous Materials

6.2 Mesoporous Materials

6.3. The future of molecular sieves

第七章 Carbon Materials (4 学时)

7.1 Basic concepts

7.2 Carbon allotropes: electronic structure and properties

7.3 Carbon nanotubes

7.4 Two dimensional carbonaceous materials

	<p>7.5 Other allotropes</p> <p>第八章 Solid state Catalysts (2 学时)</p> <p>8.1 Basic concepts</p> <p>8.2 Catalysts</p> <p>8.3 Photocatalysts</p> <p>8.4 Electrocatalysts</p>
<p>*课程简介 (Description)</p>	<p>课程大纲</p> <p>Introduction: Precourse: General introduction</p> <p>Chapter 1 Synthetic and Preparative Methods</p> <p>1.1 Ceramic method</p> <p>1.2 Sol-gel method</p> <p>1.3 Microwave synthesis</p> <p>1.4 Precursor methods</p> <p>1.5 Hydrothermal and Solvothermal methods</p> <p>1.6 Chemical vapor deposition (CVD)</p> <p>1.7 Chemical vapor transport</p> <p>1.8 Laser ablation</p> <p>1.9 Molten and Czochralski methods</p> <p>1.10 Arc discharge</p> <p>1.11 Electrochemical Preparation</p> <p>1.12 High-pressure synthesis</p> <p>Chapter 2 Characterization methods for solid materials</p> <p>2.1 X-ray diffraction techniques</p> <p>2.2 X-ray absorption spectroscopy</p> <p>2.3 X-ray and ultraviolet photoelectron spectroscopy (XPS and UPS)</p> <p>2.4 Infrared and Raman spectroscopy</p> <p>2.5 Nuclear magnetic resonance (NMR) and electron spin (paramagnetic) resonance (ESR or EPR) spectroscopy</p> <p>2.6 Scanning tunneling microscopy (STM) and atomic force microscopy (AFM)</p> <p>Chapter 3 Electrically conducting materials</p> <p>3.1 Ionic conductors</p> <p>3.2 Metallic conductors</p> <p>3.3 Semiconductors</p> <p>3.4 Insulators</p> <p>3.5 Semimetallic conductors</p> <p>3.6 Superconductors</p> <p>Chapter 4 Magnetic and Dielectric Materials</p> <p>4.1 diamagnetic materials</p>

	<p>4.2 paramagnetic materials</p> <p>4.3 ferromagnetic materials</p> <p>4.4 ferrimagnetic materials</p> <p>4.5 antiferromagnetic materials</p> <p>Chapter 5 Optical Properties of Solids</p> <p>5.1 Phenomena of light through a medium</p> <p>5.2 The interaction of light with atoms and molecules</p> <p>5.3 Solid lasers</p> <p>5.4 Optical fibers</p> <p>5.5 Optical switches</p> <p>5.6 Nonlinear optical properties of solids</p> <p>Chapter 6 Microporous and Mesoporous Materials</p> <p>6.1 Microporous Materials</p> <p>6.2 Mesoporous Materials</p> <p>6.3. The future of molecular sieves</p> <p>Chapter 7 Carbon Materials</p> <p>7.1 Basic concepts</p> <p>7.2 Carbon allotropes: electronic structure and properties</p> <p>7.3 Carbon nanotubes</p> <p>7.4 Two dimensional carboceous materials</p> <p>7.5 Other allotropes</p> <p>Chapter 8 Solid state Catalysts</p> <p>8.1 Basic concepts</p> <p>8.2 Catalysts</p> <p>8.3 Photocatalysts</p> <p>8.4 Electrocatalysts</p>
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课程教学大纲 (course syllabus)

<p>*学习目标 (Learning Outcomes)</p>	<p>1. 课堂教学主要讲解固体化学基本原理，提高学生对固体化学及相关材料的学习兴趣、使他们了解并掌握固体化学的理论体系和研究方法。课堂教学中还引入讨论。</p> <p>2. 在课堂讲授的同时，选择部分内容交由学生自学，以培养他们的自主学习能力。</p> <p>3. 团组大作业可以达到培养收集和提炼信息的能力以及团队合作精神。</p>					
<p>*教学内容、进度安排及要求</p>	<p>教学内容</p> <hr/> <p>Precourse: General</p>	<p>学时</p> <hr/> <p>2</p>	<p>教学方式</p> <hr/> <p>课堂讲授</p>	<p>作业及要求</p> <hr/>	<p>基本要求</p> <hr/>	<p>考查方式</p> <hr/>

(Class Schedule & Requirements)	introduction					
	第一章 Synthetic and Preparative Methods	4	课堂讲授			
	第二章 Characterization methods for solid materials	4	课堂讲授			
	第三章 Electrically conducting materials	4	课堂讲授			
	第四章 Magnetic and Dielectric Materials	4	课堂讲授			
	第五章 Optical Properties of Solids	4	课堂讲授			
	第六章 Microporous and Mesoporous Materials	4	课堂讲授			
	第七章 Carbon Materials	4	课堂讲授			
	第八章 Solid state Catalysts	2	课堂讲授			
					
*考核方式 (Grading)	(成绩构成) 以课堂教学平时成绩为主 (50%), 结合报告提问 (25%)、期末大作业 (25%)。					
*教材或参考资料 (Textbooks & Other Materials)	<p>(1) L. Smart and E. Moore, Solid State Chemistry – An Introduction, Chapman & Hall, 2005;</p> <p>(2) A. R. West, Solid State Chemistry and Its Applications, John Wiley & Sons, 1987. 中文译本: 固体化学及其应用, 苏勉曾等译, 复旦大学出版社, 1990。</p> <p>(3) 《无机合成与制备化学》 徐如人, 庞文琴著, 北京: 高等教育出版社, 2009;</p> <p>(4) 《无机材料化学》 林建华, 荆西平等 著, 北京: 北京大学出版社, 2006 年。</p>					

其它 (More)	
备注 (Notes)	

备注说明：

1. 带*内容为必填项。
2. 课程简介字数为 300-500 字；课程大纲以表述清楚教学安排为宜，字数不限。