

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	矿物学与岩石学 Mineralogy and Petrology				
2.	授课院系 Originating Department	海洋科学与工程系 Department of Ocean Science and Engineering				
3.	课程编号 Course Code	OCE407				
4.	课程学分 Credit Value	2				
5.	课程类别 Course Type	专业选修课 Major Elective Courses				
6.	授课学期 Semester	春季 Spring				
7.	授课语言 Teaching Language	中英双语 Bilingual				
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)	陈斌, 地球与空间科学系, 创园 9 栋 407, chenb6@sustech.edu.cn CHEN Bin, Department of Earth and Space Sciences, Chuangyuan 9-407 Tel. 13661002268				
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	王玉琼 WANG Yuqiong				
10.	选课人数限额(可不填) Maximum Enrolment (Optional)					
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	32				32

12. 先修课程、其它学习要求
Pre-requisites or Other Academic Requirements

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**

讲授火成岩、沉积岩、变质岩的基本特征和时空分布；岩石成因及其与板块构造、碰撞造山、壳幔相互作用等地球动力学过程的关系；

Main characteristics and spatial/temporal distribution of igneous, sedimentary and metamorphic rocks; Petrogenesis and relationship with geodynamic processes such as plate tectonics, collisional orogeny and mantle-crustal interaction.

16. **预达学习成果 Learning Outcomes**

1 掌握地球的核-幔-壳结构和各圈层的矿物和化学成分特征；火成岩、沉积岩和变质岩的岩石类型、分类原则、结构构造、矿物组合和化学成分的特点；

The core-mantle-crust structures and mineral/chemical compositions of the Earth; Rock types, principles of classification, textures/structures, mineral assemblages and chemical compositions of igneous, sedimentary and metamorphic rocks.

2 掌握火成岩（包括火山岩、侵入岩）的分布、岩浆起源和岩浆演化过程；火成岩的形成与全球板块构造的联系，包括板块的汇聚、离散、陆内碰撞造山等地球动力学背景对不同类型火成岩的控制作用；

Distribution, origin and magma evolution of igneous rocks (including plutonic and volcanic rocks); Magmatism and genetic link with plate tectonics, e.g., plate convergence and divergence, intra-continental collisional orogeny and controls on formation of different types of igneous rocks.

3 掌握不同类型沉积岩（碎屑沉积和化学沉积岩等）的形成机理、形成条件，能通过沉积盆地分析，解读沉积作用与古气候-古环境、大陆风化、板块构造和岩石圈演化的内在联系；

Command the diagenesis and sedimentary conditions of different types of sedimentary rocks (detrital and chemical deposits), and understand the genetic link between sedimentation and paleo-climate/environment, continental weathering, plate tectonics and lithosphere evolution on the basis of basin analyses.

4 识别变质作用的基本类型、特征，变质作用温度压力流体条件，变质作用与板块俯冲、壳幔作用和陆内碰撞造山等造山带演化过程的关系，变质作用与造山型铜金多金属矿的联系，

Understand the main characteristics of metamorphism, metamorphic P-T-x conditions, relationship between metamorphism and slab subduction, mantle-crustal interaction and intra-continental collisional orogeny, and genetic link with copper multi-metallogenesis during orogenic evolution.

5 掌握经典的高温高压实验研究成果和相平衡/模拟知识，及其对解释岩石成因和地球动力学演化的意义。

Command basic high P-T experimental results and phase equilibrium/modelling, and implications for petrogenesis and geodynamic evolution.

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 岩石学导论（2学时） Chapter 1 Introduction to Petrology (2 hours)

介绍地球圈层结构和板块构造，及其对岩浆作用、沉积作用、变质作用和相关成矿作用的控制。

Introduction to the core-mantle-crust structures and plate tectonics of Earth, controls on magmatism, sedimentation,

metamorphism and metallogenesis;.

第二章 岩浆和岩浆岩分类 (2 学时) Chapter 2 Magma and classification of igneous rocks (2 hours)

介绍岩浆的性质 (密度、粘度、温度等); 火成岩的分类, 以及各类火成岩的基本特征、矿物组成、结构构造。

Characteristics of magma (density, viscosity and temperature, etc), classification of igneous rocks, basic features, minerals, textures and structures of different rock types.

第三章 相关系 (4 学时) Chapter 3 Phase relations (4 hours)

介绍相律的概念和典型的相图, 及其对解释玄武岩和花岗岩岩浆起源和演化的意义。

Phase rules, typical phase relations, and their significance in explaining the origin and evolution of basaltic and granitic magmas.

第四章 微量元素 (2 学时) Chapter 4 Trace elements (2 hours)

微量元素的分类, 微量元素的性质和配分, 微量元素对研究岩浆起源和演化的意义;

Classification of trace elements, features and partitioning of trace elements, and their roles in revealing magma origin and evolution.

第五章 Rb-Sr 和 Sm-Nd 同位素 (2 学时) Chapter 5 Rb-Sr and Sm-Nd isotope systematics (2 hours)

介绍 Rb-Sr 和 Sm-Nd 同位素体系的性质, 同位素定年和示踪的原理, 及其在岩石学研究中的意义;

Characteristics of Rb-Sr and Sm-Nd isotopic systematics, fundamentals of isotopic dating and tracing, and implications for understanding petrogenesis of different rocks;

第六章 超镁铁质和镁铁质杂岩 (2 学时) Chapter 6 Ultra-ferromagnesian Rocks and Ferromagnesian complex (2 hours)

地幔的岩石和矿物组成; 常见镁铁质-超镁铁质杂岩体的特征和成因, 包括大型层状杂岩体、环状杂岩体、碱性-亚碱性杂岩和蛇绿岩等; 相关的成矿作用 (包括金刚石矿、铜镍矿、铬铁矿等)

Mantle rocks and constituent minerals; characteristics of main ultra-ferromagnesian rocks and ferromagnesian complexes, including large-scale layered and circled intrusions, alkali complexes and ophiolite suites, and associated ore deposits (diamond, Cu-Ni and Cr-Fe deposits).

第七章 玄武岩的起源和成因 (2 学时) Chapter 7 Origin and Petrogenesis of Basalts (2 hours)

玄武岩系列划分, 玄武岩的成分和结构构造, 玄武岩的成因和板块构造的联系, 相图及其在玄武岩成因研究方面的应用

Classification of basalt series, textures and structures of basalts, petrogenesis of basalts and genetic link with plate tectonics, and phase modelling and application in study of basalt petrogenesis.

第八章 中性-中酸性岩浆的起源和成因 (4 学时) Chapter 8 Origin and Petrogenesis of Intermediate- to Felsic rocks (4 hours)

介绍安山岩的分类、成因及其与板块俯冲作用的联系; 花岗岩的分类和成因及其与板块俯冲和碰撞造山作用的联系; 花岗岩与稀有金属成矿的关系

Introduction to the classification, petrogenesis and genetic link with plate tectonics; granites and relationship with slab

subduction and collisional orogeny; relationship between granite magmatism and metallogenesis.

第九章 沉积岩的分类和大陆风化 (2 学时) Chapter 9 Classification of sedimentary rocks and continental weathering (2 hours)

介绍沉积岩的分类, 沉积岩的形成条件, 以及各种沉积岩的矿物成分和结构构造特征; 大陆风化作用的过程和产物。

Classification and formation conditions of sedimentary rocks; constituent minerals, textures and structures of different sedimentary rocks; processes and products of continental weathering;

第十章 成岩作用和碎屑沉积岩 (2 学时) Chapter 10 Diagenesis and detrital deposits (2 hours)

介绍成岩作用过程、条件, 碎屑岩的基本特征和成因;

Processes and conditions of diagenesis; basic features of detrital sediments and sedimentation;

第十一章 化学沉积作用和化学沉积岩 (4 学时) Chapter 11 Chemical Sedimentation and Chemical deposits (4 hours)

化学沉积, 碳酸盐岩的分类, 碳酸盐岩的沉积环境和成因, 生物沉积作用和生物沉积岩; 介绍海相灰岩、白云岩、菱镁矿、硅质岩、硅铁建造等的成因。

Chemical sedimentation and carbonate classification, sedimentary settings of marine carbonates, bio-sedimentary rocks; Introduction to limestone, dolostone, magnesite, silicious rocks, Si-Fe formation, etc.

第十二章 变质作用和变质岩 (2 学时) Chapter 12 Metamorphism and Metamorphic Rocks (2 hours)

变质作用机制, 变质岩的矿物成分、化学成分, 变质岩的结构构造, 变质岩分类;

Mechanism of metamorphism, mineral and chemical compositions of metamorphic rocks, classification and textures/structures of metamorphic rocks.

第十三章 变质反应、变质带和变质相 (系) (2 学时) Chapter 13 Metamorphic Reaction, metamorphic Belts and Metamorphic Series (2 hours)

变质反应基本类型和特征, 包括连续反应和交换反应(固-固反应, 脱水反应, 脱 CO₂ 反应等), 变质带、变质相 (系) 的概念, 矿物相律和矿物组合分析;

Major types and features of metamorphic reactions, including continuous reaction and exchange reaction (solid-solid reaction, dehydration reaction, decarbonation reaction, ect), concepts of metamorphic belt and series, phase rules of minerals and assemblage analysis,

第十四章 变质作用与造山带演化 (2 学时) Chapter 14 Metamorphism and Orogenic Evolution (2 hours)

变质作用温压流体(P-T-x)条件, 变质作用 P-T-t 轨迹和大陆碰撞造山; 造山带演化过程中变质流体的形成、性质和及其对成矿作用的控制;

P-T-fluid conditions of metamorphism, P-T-t paths of metamorphism and mountain-building processes, formation and nature of metamorphic fluids and controls on metallogenesis.

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

1. 教材: 桑隆康, 马昌前. 岩石学. 地质出版社, 2012;
Textbook: Sang LK and Ma CQ, Petrology, Geological Publishing House, 2012

2. 其它参考资料: Supplementary Readings

Myron G. Best. Igneous and Metamorphic Petrology (Second Edition). Blackwell, 2003

徐夕生, 邱检生. 火成岩岩石学. 科学出版社, 2010
Xu XS and Qiu JS, Igneous Petrology, Sci. Press, 2010

常丽华等. 透明矿物薄片鉴定手册. 地质出版社, 2006
Chang et al., Identification of Transparent Minerals Under Microscope, Geological Publishing House, 2006

常丽华等. 火成岩鉴定手册. 地质出版社, 2009
Chang et al., Identification of Igneous Rocks, Geological Publishing House, 2009

课程评估 ASSESSMENT

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		5		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam		90		
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

海洋科学与工程系本科教学委员会

Department of Ocean Science and Engineering Undergraduate Committee

