

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	有机地球化学 Organic Geochemistry
2.	课程性质 Compulsory/Elective	专业选修 Major elective
3.	课程学分/学时 Course Credit/Hours	3/64
4.	授课语言 Teaching Language	中英文 Chinese and English
5.	授课教师 Instructor(s)	周友平 Youping ZHOU
6.	是否面向本科生开放 Open to undergraduates or not	是, 面向本科生开放 Yes, open to both undergraduate and postgraduate students
7.	先修要求 Pre-requisites	如面向本科生开放, 请注明区分内容。 Please indicate any differences in pre-requisite courses for undergraduate and post-graduate students. 所有修课者都必须具有基础有机化学(例如, 化学原理 CH101A 及化学原理 CH101B)、基础生物学(例如, 生物学原理 BIO103)和普通地质学(例如, 普通地质学 OCE303)知识。 A basic knowledge of organic chemistry (for example, CH101A and CH101B or equivalent), introductory geology (for example, OCE303 or equivalent) and introductory biology (for example, BIO103 or equivalent) from the prerequisite courses is assumed for the course attendees, postgraduates and senior undergraduates.
8.	教学目标 Course Objectives	如面向本科生开放, 请注明区分内容。 Please indicate any differences in expectations and outcomes for undergraduate and post-graduate students.
		本课程面向研究生, 通过 64 学时的理论和实践课, 让学生: 1) 在深层次上掌握地球圈层中有机质的来源、保存、迁移及降解(及衰减)过程; 2) 能够依据科学问题、确定对象有机分子, 采用最有效的提取、分离、纯化方案获得对象分子, 并综合运用现代分析手段、获得对象分子的结构、组成、化学丰度和同位素丰度; 3) 熟练利用记录在地球圈层中的有机分子结构、化学丰度和自然丰度同位素组成进行生物合成途径、代谢方式、环境及气候信息重建及预测有机分子在地质条件下演化、产油和产气潜势和环境后果。 本课程教学目标对本科生和研究生选课者无任何差别。 This 48-credit-hours postgraduate level course, will be delivered via regular online and/or offline lectures and laboratory practicum. The attendees will acquire: 1) a deeper understanding of the origin of organic matter in the geosphere, and its preservation, migration and degradation (natural attenuation) processes and how such processes are embodied in carbon cycles on various temporal and spatial scales; 2) ability to utilize a combination of pretreatment techniques to efficiently and reliably isolate target molecules of interest from geological matrices, and to structurally and isotopically characterize the target molecules effectively with a range of analytical instrumentations, and 3) ability to apply the structural and isotopic fingerprints of geo-organic molecules to the elucidation of biosynthetic pathways, mechanisms of metabolic reactions, extraction of environmental and climatic signals, and to predict the fate of geo-organic molecules in the context of oil and gas generation potential and environmental consequences. Course expectations and outcomes for both undergraduate and post-graduate students will be the same.
9.	教学方法 Teaching Method	如面向本科生开放, 请注明区分内容。If the course is open to undergraduates, please indicate the difference.
		本课程将以在线或者离线方式授课并结合实验室实践进行; 可以预约进行课堂外辅导。 The course will be delivered via regular online and/or offline lectures (including those delivered by invited lecturers) and laboratory-based practicum. Out-of-class tutorials are available by appointments.

本课程教学方法对本科生和研究生选课者无任何差别。
Teaching methods for both undergraduate and post-graduate students will be the same.

10. 教学内容

Course Contents

如面向本科生开放，请注明区分内容。

Please indicate any differences in course contents for undergraduate and post-graduate students.

课程内容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 contents as follows may be subject to change, either during the session due to 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.

本课程教学内容对本科生和研究生选课者无任何差别。
Course contents for both undergraduate and post-graduate students will be the same.

Section 1	Life, evolution, origin of organic matter and carbon cycle (2 credit hours) 生命，演化及有机碳来源及碳循环（2 学时）
Section 2	Organic matter in the geosphere: Introduction (2 credit hours) 地圈中的有机质： 引言（2 学时）
Section 3	Organic matter in the geosphere: Bitumen and Kerogen (2 credit hours) 地圈中的有机质： 沥青与干酪根（2 学时）
Section 4	Organic matter in the geosphere: Oil and Gas (2 credit hours) 地圈中的有机质： 石油和天然气（2 学时）
Section 5	Isolating bitumen and kerogen from source rock (laboratory, 4 credit hours) 从油源岩中分离沥青和干酪根（实验，4 学时）
Section 6	Molecular aspects of organic matter: composition, structure, function and geochemistry (2 credit hours) 有机质化学组成、结构、官能团及地球化学（2 学时）
Section 7	Molecular aspects of carbohydrates: composition, structure, function and geochemistry (2 credit hours) 碳水化合物化学组成、结构、官能团及地球化学（2 学时）
Section 8	Isolating carbohydrates from marine algae (laboratory, 4 credit hours) 从海藻中提取和纯化碳水化合物（实验，4 学时）
Section 9	Molecular aspects of proteins: composition, structure, function and geochemistry (2 credit hours) 蛋白化学组成、结构、官能团及地球化学（2 学时）
Section 10	Molecular aspects of nucleic acids: composition, structure, function and geochemistry (2 credit hours) 核酸化学组成、结构、官能团及地球化学（2 学时）
Section 11	Isolating proteins from water column (laboratory, 4 credit hours) 从海水总提取和纯化蛋白（实验，4 学时）
Section 12	Molecular aspects of lipids (fatty acids): composition, structure, function and geochemistry (2 credit hours) 脂肪酸化学组成、结构、官能团及地球化学（2 学时）
Section 13	Molecular aspects of lipids (hydrocarbons): composition, structure, function and geochemistry (2 credit hours) 烃类化合物化学组成、结构、官能团及地球化学（2 学时）
Section 14	Molecular aspects of lipids (alkenones, polar lipids and ether lipids): composition, structure, function and geochemistry (2 credit hours) 烯酮、酯键合及醚键合类脂化学组成、结构、官能团及地球化学（2 学时）
Section 15	Molecular aspects of lipids (steroids, hopanoids and triterpenoids): composition, structure, function and geochemistry (2 credit hours) 甾类、藿类及其它萜类化合物化学组成、结构、官能团及地球化学（2 学时）

Section 16	Isolating lipids from ocean sediments (laboratory, 4 credit hours) 从海洋沉积物中提取和纯化类脂化合物 (实验, 4 学时)
Section 17	Molecular aspects of pigments (chlorophylls, carotenoids, and phycobilins): composition, structure, function and geochemistry (2 credit hours) 叶绿素、类胡萝卜素、藻胆素化学组成、结构、官能团及地球化学 (2 学时)
Section 18	Molecular aspects of cellulose, hemicellulose and chitin: composition, structure, function and geochemistry (2 credit hours) 纤维素、半纤维素及几丁质化学组成、结构、官能团及地球化学 (2 学时)
Section 19	Molecular aspects of lignin, cutin and suberin: composition, structure, function and geochemistry (2 credit hours) 木质素、角质及木栓质化学组成、结构、官能团及地球化学 (2 学时)
Section 20	Molecular aspects of aromatics: composition, structure, function and geochemistry (2 credit hours) 芳香化合物化学组成、结构、官能团及地球化学 (2 学时)
Section 21	Isolating pigments from marine algae (laboratory, 4 credit hours) 从海藻中提色素分子 (实验, 4 学时)
Section 22	Analytical methods: sampling and pretreatment (storage, extraction, fractionation, derivatisation) (2 credit hours, laboratory-based practicum) 分析方法: 取样及前处理 (保存、提取、组分割、衍生) (实验, 4 学时)
Section 23	Analytical methods: structural instrumentation (GC, LC, UV, IR, MS, NMR, pyrolysis) (2 credit hours, laboratory-based practicum) 分析方法: 结构分析 (GC, LC, UV, IR, MS, NMR, Pyrolysis) (实验, 4 学时)
Section 24	Analytical methods: isotopic instrumentation (irms, nmr, spectroscopy) (2 credit hours, laboratory-based practicum) 分析方法: 同位素分析 (BSIA, CSIA, PSIA by IRMS, NMR, spectroscopy and wet chemistry) (实验, 4 学时)

11. 课程考核

Course Assessment

考核形式 Form of examination; 分数构成 grading policy;

如面向本科生开放, 请注明区分内容。

If the course is open to undergraduates, please indicate the difference.

闭卷考试(45%), 开卷考试(15%), 作业(30%)和出勤率(10%)

The course attendants will be assessed by a combination of closed-book (45%) and open book (15%) examinations plus assignments (30%) and attendance (10%).

十三级(F, D-, D, D+, C-, C, C+, B-, B, B+, A-, A, A+)积分制; 无正当理由不参加考试和实践者, 以不及格计。

Students will be graded with a 13-level (F, D-, D, D+, C-, C, C+, B-, B, B+, A-, A, A+) grading system; failure to sit examinations/attend practicum without justifications will be graded as F (failure).

本课考试对本科生和研究生选课者无任何差别。

Course assessments for both undergraduate and post-graduate students will be the same.

12. 教材及其它参考资料

Textbook and Supplementary Readings

1. Stephen D. Killops and Vanessa J. Killops (2005) Introduction to Organic Geochemistry, 2nd edition. Blackwell Publishing.
2. Thomas S. Bianchi and Elizabeth A. Canuel (2011) Chemical Biomarkers in Aquatic Ecosystems. Princeton University Press, Princeton, New Jersey.
3. Jan Schwarzbauer and Branimir Jovančičević (2015) Fundamentals in Organic Geochemistry. Fossil Matter in the Geosphere. Springer International Publishing, Switzerland
4. Jan Schwarzbauer and Branimir Jovančičević (2016) Fundamentals in Organic Geochemistry. From Biomolecules to Chemofossils. Springer International Publishing, Switzerland.
5. Jan Schwarzbauer and Branimir Jovančičević (2018) Fundamentals in Organic Geochemistry. Organic Pollutants in the Geosphere. Springer International Publishing, AG
6. Jan Schwarzbauer and Branimir Jovančičević (2020) Fundamentals in Organic Geochemistry. Introduction to Analytical Methods in Organic Geochemistry. Springer Nature Switzerland.