

# 上海交通大学研究生课程开设申请表

## New Graduate Course Application Form, SJTU

课程基本信息 Basic Information				
<b>*课程名称</b> Course Name	(中文 Chinese) 材料电化学			
	(英文 English) Materials of Electrochemistry			
<b>*学分</b> Credits	2	<b>*学时</b> Teaching Hours	32 (1学分≥16课时)	
<b>*开课学期</b> Semester	春季学期 Spring	<b>*是否跨学期</b> Cross-semester?	否 No	跨 Spanning over 一个学期 Semesters (含夏季学期)。
<b>*课程性质</b> Course Category	专业课 Specialized Course	<b>*课程分类</b> Course Type	全日制课程 For full-time students	
<b>*授课语言</b> Instruction Language	中文 Chinese	<b>主要授课方式</b> Teaching Method	课堂教学 In class teaching	
<b>*成绩类型</b> Grade	等第制 Letter grading	<b>主要考核方式</b> Exam Method	考查 Tests	
<b>*开课院系</b> School	材料科学与工程学院			
<b>所属学科</b> Subject				
<b>负责教师</b> Person in charge	姓名 Name	工号 ID	单位 School	联系方式 E-mail
	付超鹏		材料科学与工程学院	chaopengfu@sjtu.edu.cn
课程扩展信息 Extended Information				
<b>*课程简介</b> (中文) Course Description	<p>《材料电化学》课程内容涉电化学界面基本特征、电化学热力学、电化学动力学、电池电化学、电化学沉积、电化学氧化、电催化以及纳米电化学等材料电化学应用的诸多方面。课程将讲授电化学基本体系和理论，介绍与材料科学紧密相关的电化学过程及参数，讲解电化学研究方法，以及电化学在材料领域方面的应用，同时对材料电化学研究前沿进行补充。课程侧重理论与实际应用相结合，通过应用实例对当今材料科学中的重要材料的电化学体系，使学生充分认识到电化学在材料研究领域的重要性。通过本课程的学习，使学生能够熟练地理解与掌握材料电化学相关知识和应用，为其后续材料和电化学方面的研究奠定坚实的理论基础，分析及解决相关的实际问题。</p>			
<b>*课程简介</b> (English) Course Description	<p>The course of materials electrochemistry covers the basic characteristics of electrochemical interface, electrochemistry thermodynamics, electrochemical kinetics, battery electrochemistry, electrochemical deposition, electrochemical oxidation, electrocatalysis and nano-electrochemical applications. The course will teach the fundamentals of electrochemistry, the electrochemical process and parameters closely related to material science, the electrochemical methods, and the application of electrochemistry in the field of materials. The research frontier of electrochemical materials will also be introduced. The course focuses on the combination of theory and practical application. Through the case studies, the students can fully realize the importance of electrochemistry in the field of materials. After the study of this course, students are expected to understand and master the knowledge and application of electrochemical materials, build a solid theoretical</p>			

	foundation for their subsequent research on materials and electrochemistry, and have the capabilities to analyze and solve the practical problems.		
*教学大纲 (中文) Syllabus	教学内容 Content	授课学时	教学方式
	1. 电化学界面的基本结构特征: 电毛细现象; 双电层的微分电容; 双电层的结构; 零电荷电位; 电极/溶液界面的吸附现象。	2	课堂
	2. 电化学热力学: 相间电位与电极电位, 电化学平衡基本条件判断	4	课堂
	3. 电化学动力学: 电极极化, 电极过程的基本历程, 电极动力学, 多电子电极反应	6	课堂
	4. 电池电化学, 电池伏安特性和充放电机理, 电池参数与测量, 自放电, 典型电池介绍。	4	课堂
	5. 材料电氧化: 电化学阳极过程, 电解抛光, 阳极氧化, 电聚合	2	课堂
	6. 金属电沉积: 金属/合金电沉积, 金属形核和生长, 沉积电势和沉积过电势, 欠电势沉积	4	课堂
	7. 电催化材料: 电催化基本原理, 电子结构和表面结构对电催化速度影响, 析氢、吸氧电化学, 氧还原电催化。	2	课堂
	8. 纳米材料电化学: 纳米尺度的电化学	2	课堂
	9. 工业电化学过程: 电化学冶金, 熔盐铝电解, 金属材料电化学提纯	2	课堂
	10. 实验 (实践): 科研实验室实验或工厂实践	4	实践
*教学大纲 (English) Syllabus	Content	Hours	Format
	1. Characteristics of the electrode/electrolyte interface: Electrocapillarity effect, Electrical double-layer capacitance, Structure of electrical double layer, Potential at zero charge, Adsorption at the electrode / solution interface.	2	In class
	2. Thermodynamics of electrochemistry: Interphase potential and electrode potential, electrochemical equilibrium.	4	In class
	3. Kinetics of electrode reactions: Electrode polarization, Electrode Processes, Kinetics, Multistep mechanisms	6	In class
	4. Electrochemical batteries, Voltammetric characteristics, Charge/discharge mechanism, Parameters and electrochemical measurements of batteries, Introduction of typical batteries.	4	In class
	5. Anodization : Electrochemical oxidation processes, Electrochemical polishing, Anodization , Electrochemical polymerization	2	In class
	6. Electrodeposition: Electrodeposition of metals and alloys, Nucleation and growth, under potential electrodeposition.	4	In class
	7. Electrocatalysis : Fundamental of electrocatalysis , Electrocatalysts , Hydrogen evolution reaction, Oxygen evolution reaction, Oxygen reduction reaction.	2	In class
	8. Electrochemistry of nanomaterials: Electrochemistry at nanoscale	2	In class
	9. Industrial electrochemistry: Electrochemical metallurgy, Electrolysis of aluminium, Electrochemical purification of metals	2	In class
	10. Experiment (practice): scientific experiment or factory practice	4	Out class

<p>*课程要求 (中文) Requirements</p>	<p>在课程结束后,要求学生能理解基本的电化学理论,并掌握用电化学的方法来研究材料在电池、电镀、阳极氧化及催化等领域的应用。课程考核方式和成绩构成如下: 1.课堂讨论:(15%) 2.课后测验:(35%) 3.期末考试:(50)</p>
<p>*课程要求 (English) Requirements</p>	<p>At the end of the course, the students are expected to understand electrochemical fundamentals and master the electrochemical methods to study materials in the fields of battery, electroplating, anodizing and catalysis. The assessment and grade are as follows: 1. Discussion = 15% 2. Quiz=35% 3. Final examination = 50%</p>
<p>课程资源 (中文) Resources</p>	<p>[1] 李荻. 电化学原理 (第三版).北京:北京航空航天大学出版社 [2] 查全性.电极过程动力学导论 (第三版).北京:科学出版社 [3] A. J. Bard. Electrochemical methods: Fundamentals and Applications (2nd Ed). Wiley, New York</p>
<p>课程资源 (English) Resources</p>	<p>[1] 李荻. 电化学原理 (第三版).北京:北京航空航天大学出版社 [2] 查全性.电极过程动力学导论 (第三版).北京:科学出版社 [3] A. J. Bard. Electrochemical methods: Fundamentals and Applications (2nd Ed). Wiley, New York</p>
<p>备注 Note</p>	