

Course Information					
* (Course Code)	MT350	* (CreditHour)	48	* 出 (Credit)	3
* (Course Name)	Thermodynamics of Materials				
(Course Type)					
(Audience)	Juniors of SMSE@SJTU				
(Language of Instruction)	中文/英文				
* School	School of Materials Science and Engineering				
Prerequisite	Mathematics; General Physics; General Chemistry				
Instructor	ZHANG Peng ZOU Jianxin	(CourseWebpage)	<a href="http://cc.sjtu.edu.cn/G2S/OC/Site/main#/home?currentoc=7952">http://cc.sjtu.edu.cn/G2S/OC/Site/main#/home?currentoc=7952</a>		
* Description					
* Description	<p>This course introduces the fundamental concepts/theories on the thermodynamic materials, from the basic concepts of enthalpy, entropy, free energy, and the basic laws of thermodynamics, to the behaviors of the systems including equilibrium, phase transformation, chemical reactions, mixing, cooling etc. Statistical thermodynamics is also introduced to explain the basic rules of thermodynamics from the microscopic aspect. Topics include: First, Second, and Third Law of thermodynamics, concepts of systems, free energy, equilibrium, solution, dilute solutions, mixing, phase equilibrium, phase rules, phase diagrams, statistical mechanics, and surface phenomena. Specific applications and problem solving of these basic concepts in air conditioning, batteries, desalination, and metallurgy etc. are also discussed.</p>				

course syllabus						
* (Learning Outcomes)	1. 出 些 与 1.1					
	2. 与 4.2					
	3. 与 4.3					
	4. 些 与 7.1 7.2					
* 与 (relationship between the course objectives and graduation requirements)	与					
	1	1.1	与	与	1	
	4	4.2			2	与
		4.3			3	
	7	7.1	些		4	与
7.2				与		
* (Class Schedule & Requirements)				与		
	The First Law	4	Lecture	Question answer and principle understanding	To have a general scenario of materials science and thermodynamics. To understand the main contents and the principles of thermodynamics as well as their interaction with materials science.	homework
	The Second Law	4	Lecture	Question answer and principle understanding	To understand the derivation and physical meaning of entropy, a state function of system; To understand the importance of the second law of thermodynamics; be able to interpret the heat engine process and application; be able to understand the principle of	homework

					idealization in the analysis of a system; to calculate the change of entropy of a system and to understand the third law of thermodynamics.	
	Relationship of thermodynamic properties of a system	4	Lecture	Question answer and principle understanding	To derive the partial derivation expression of Gibbs free energy; to know the principle of chemical potential and partial molar quantity; to understand the concept of and application of thermodynamic relations	homework
	Equilibrium	3	Lecture	Question answer and principle understanding	To know the conditions of equilibrium; derive the Clapeyron equation and understand the application of the Clapeyron equation in real cases; understand the orders of transitions.	homework
	Chemical Equilibrium	3	Lecture	Question answer and principle understanding	The principle of thermodynamic activity; the idea of chemical equilibrium and the calculation of equilibrium constant; the derivation of Ellingham diagram and its application in telling the relative stability of oxides; the calculation of adiabatic flame temperature using the principle of chemical equilibrium.	homework
	Electrochemistry	6	Lecture	Question answer and principle understanding	To understand the fundamentals of electrochemical cell and the calculation of cell voltage	homework

				<p>understand the half-cell reaction and the direction of electrochemical reaction; know the variation of cell voltage with the change of solution concentration as well as the application of Nernst equation; understand the application of electrochemical potential. e.g. concentration cells oxygen pressure determination; know the concepts of electrochemical potential.</p>
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Solution	6	Lecture	<p>Question answer and principle understanding</p>	<p>To know concepts of thermodynamic activity/partial molar quantities and relative partial molar quantities; understand the calculation of mixing entropy and enthalpy of ideal solution as well as the graphing homework understand the Gibbs-Duhem equation, dilute solution and colligative properties of dilute solution; know the principle of regular solution and its microscopic explanation.</p>
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	Phase Diagrams	8	Lecture	Question answer and principle understanding	To know the lever rule cooling curves; understand the principle of simple Eutectic diagram, complete miscibility, immiscibility, and Peritectic phase diagrams understand the fundamental of ternary phase diagram.	homework
	Statistical Thermodynamics	2	Lecture	Question answer and principle understanding	To know the principle of macrostate and microstate understand Hypothesis of Boltzmann and Boltzmann distribution; understand the Statistical explanation of entropy and ideal gas	homework
	Experiment	2	experiments	Measurement and analysis	To understand the dynamics of the experiments	report
	Interface and Surface Thermodynamics	4	Lecture	Question answer and principle understanding	To know the principle of surface energy and the method to measure the surface energy; understand vapor pressure on curved liquid surface, solubility and melting point of small particles; explain the phenomena of wetting, physical and chemical adsorption.	homework
*	(Grading)	1. Home assignments (20%); 2. Quizzes and class performance (10%); 3. Midterm exam (30%); 4. Final exam (40%).				
*	(Textbooks &	1. Thermodynamics of Materials David V. Rangone John Wiley & Sons, Inc 1995 2. 1999				

Other Materials)	<p>3. 1997</p> <p>4. 1992</p> <p>5. 径 1981</p> <p>6. 径 2009.</p> <p>7. 与 2006.</p>
More	
Notes	

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