60618 - Advanced physical chemistry

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	542 - Master's in Chemical Research
ECTS	6.0
Course	1
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The aim of this course is to provide the students an advanced formation on the most important practical aspects, both experimental and theoretical, about Phase Equilibria, and the most relevant applications of Electrochemistry related to organic and inorganic synthesis, metal electrodeposition, surface treatment, electrochemical energy converters (cells, rechargeable batteries and fuel cells), corrosion and polluting removal processes and environment cleaning.

Learning proceeding designed combines information or conceptual activities with those corresponding to evaluation and

practical cases based learning. Conceptual activities will be combined strategically with practical network and independent learning in order to get maximum academic progress.

5.2.Learning activities

5.3.Program

Part 1: Phase Equilibria

1. Thermodynamic grounds of phase equilibrium.

2. Liquid-vapour equilibrium at low-pressures and high-pressures.

- Experimental techniques

- Theoretical models: Data correlation - Prediction methods (Group Contribution, Equations of State (EoS), Combined EoS + excess function, Statistical Methods (Perturbations, SAFT, etc)

3. Other phase equilibria (S-L, L-L, S-G)

4. Phase equilibria applications: separation, extraction, reaction.

Part 2: Electrochemistry

1. Electrochemical synthesis: fundamentals, methods and equipment. Traditional and advanced processes.

2. Metal electrodeposition and electrochemical treatment of surfaces: fundamentals, operations and installations. Actual advances.

3. Corrosion: classification, extent and prevention. Practical examples.

4. Electrochemical energy converters: cells, batteries. Fuell cells.

5. Electrochemistry, environment and sustainability.

5.4.Planning and scheduling

5.5.Bibliography and recomended resources

- **BIBLIOGRAPHY**

1. Termodinámica Química (2ª edición). J. A. Rodríguez Renuncio, J. J. Ruiz Sánchez y J. S. Urieta Navarro. Ed

Síntesis 2000.

2. Classical Thermodynamics of Nonelectrolyte Solutions. H. C. van Ness y M. M. Abbott. Ed. McGraw-Hill 1982.

3. The Properties of Gases and Liquids, B.E. Poling, J.M. Prausnitz, J.P. O'Connel, McGraw Hill 5 th edition 2007.

4. Termodinámica Molecular de los Equilibrios de Fases. J. M. Prausnitz; R. N. Lichtenthaler y E. Gomes de Azevedo. Ed. Prentice-Hall 2000

5. Electroquímica Moderna. J. O'M. Bockris y A. K. N. Reddy. Ed. Reverté 1980.

6. Electrochemistry. C.H. Hamann, A. Hamnett y W. Vielstich. Wiley-VCH 1998.

- **SPECIALISED BIBLIOGRAPHY**

1. Supercritical Fluids. Fundamentals for application. E. Kiran y J. M. H. Levelt Sengers. Kluwer Academic Publishers 2000.

2. Supercritical Fluid Extraction (2 nd edition). M. McHugh y V. Krukonis. Ed. Butterworth-Heinemann 1994.

3. Fundamental of Supercritical Fluids. T. Clifford. Oxford Science Publications 1999.

4. Thermodynamic Properties of Complex Fluid Mixtures. Research Report G. Maurer. Deutsche Forschungsgemeinscgaft. Wiley-VCH 2004.

5. Electrochemistry. Principles, methods and applications. C.M.A. Brett y A.M. Oliveira Brett. Oxford University Press 1993.

6. Control de la corrosión. Estudio y medida por técnicas electroquímicas. J. A. González Fernández. C.S.I.C. 1989.

7. Electrosíntesis y electrodiálisis. Fundamentos, aplicaciones tecnológicas y tendencias. J.R. Ochoa Gómez. McGraw-Hill 1996.