

CH-443 Photochemistry II		Photochemistry II	
Lecturers : Moser Jacques-Edouard			Language : English
Cursus Molecular & Biological Chemistry (2013-2014, CGC - Master 2013 chimiste) Photonics (2013-2014, EDPO 2013-14)	Semester Mand. MA2	Option x Filières x	Credits : 2 Number of hours : A week: 2h Distribution : Lecture : 2h hebdo

SUMMARY

Following "Photochemistry I", this course focuses on the photoredox processes at the surface of solids. An introduction to the current theoretical models of electron transfer dynamics is provided. Current technological applications, as well as the most recent advances in the field are then detailed.

CONTENT

- 1. Dynamics of photoinduced electron transfer.** Theoretical models of charge transfer dynamics - Marcus-Hush theory - Fermi golden rule - Semi-classical model - Photoinduced ET - Sensitization of a wide bandgap semiconductor - Detailed treatment of examples of homogeneous and micro-heterogeneous systems
- 2. Photoelectrochemistry of semiconductors.** Contact phenomena at the solid/solid and solid/electrolyte interfaces - Case of finely dispersed semiconductor particles - Ions specific adsorption and surface states - Dynamics of charge carriers in the solid - Spectral sensitization of large bandgap semiconductors
- 3. Photo-electrochemical conversion of solar energy.** Thermodynamic principles and limitations of solar energy conversion efficiency - Photogalvanic and photovoltaic cells - Artificial photosynthesis
- 4. Photocatalysis.** Advanced oxidation processes
- 5. Photographic and xerographic processes.** Molecular systems - Photopolymer systems - Electrophotography - Offset printing - Silver photography - Color reproduction
- 6. Optical data storage.** Color theory - High resolution spectroscopy - Optical discs - Holography.

Keywords

Electron transfer dynamics, Marcus theory, Fermi Golden Rule, Photoinduced electron transfer, Homogeneous and nano-heterogeneous model systems, Semiconductor photoelectrochemistry, Photoelectrochemical conversion of solar energy, Photocatalysis, Photography and xerography, Color theory, Optical data storage

LEARNING PREREQUISITES

Recommended courses

Photochemistry I

LEARNING OUTCOMES

By the end of the course, the student must be able to:

- Explain the principles of current models of the electron transfer (ET) dynamics
- Discuss the hypotheses made in the various approximations of these theories
- Describe the predictions of classical and semi-classical ET theories
- Represent and explain the constitution of space charge layers at interfaces
- Distinguish the various sources of the limitation of solar energy conversion efficiency
- Represent the principle of photovoltaic and solar fuels generation systems
- Describe the principle of the functioning of photographic and xerographic processes
- Formulate the theory of colors and explain its application to high resolution spectroscopy
- Propose an example of a photoinduced interfacial electron transfer process and discuss the parameters controlling its rate and efficiency

TEACHING METHODS

Ex cathedra lectures

ASSESSMENT METHODS

Final oral examination

SUPERVISION

Office hours	No
Assistants	No
Forum	No

RESOURCES

Notes/Handbook

Copies of the slides are available in pdf format on the course's web site

Websites

<http://photochemistry.epfl.ch/PC.html>

CREDITS AND WORKLOAD

Credits	2
Total workload	60h
Exam session	Summer
Type of assessment	Oral