



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Introduction to photochemistry

2324-1-124R022

Title

Introduction to photochemistry

Teacher(s)

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Language

English

Short description

The basic principles of Photophysics and photochemistry applied to photocatalysis

- Unimolecular and bimolecular excited state decay processes
- Dyad photosensitizer-catalist in photocatalysis
- Photoinduced Electron transfer: Marcus theory and quantum approach
- Energy transfer: Förster and Dexter mechanism
- *All-in-one* example: [Ru(bpy)₂]²⁺ in electron-transfer and energy transfer photocatalysis
- How to investigate photocatalytic processes: experimental techniques (absorption and emission

spectroscopies, photochemical kinetic measurement within Stern-Volmer equation) and computational approaches (Time-dependent DFT)

Photophysics:

- light-matter interaction and photostimulation processes
- Interactions between atoms and molecules and photographic processes
- Frank-Condon's Principle
- Dynamics and time scale for decaying an excited state (fluorescence, phosphorescence)

Photochemistry:

- Organic photochemistry and photochemical processes
- Organic photochemistry: Photostimulate organic reactions
- Radical or ionic dissociation
- Intramolecular rearrangements and photoisomers
- Hydrogen atom abstraction
- Photodimerization, photoaddition, photoionisation reactions
- Photochemical activity of aromatic compounds
- photochemistry of diazo- and azide compounds
- Photo-removable protective groups
- Chemiluminescence

Technical and experimental aspects of organic photochemistry

- Inorganic photochemistry and coordination compounds
- Characterization of the inorganic and coordinated electron spectra
- Decay and Lifetime kinetics of an excited state
- Energy transfer: Förster and Dexter mechanism
- Electron transfer: Marcus theory and quantum approach
- Proton-coupled electron transfer
- Redox properties of excited states of coordination compounds: the case of $[\text{Ru}(\text{bpy})_3]^{2+}$;

Objective of the program: The mini-course of photochemistry is an introduction to a selection of general, organic, inorganic, biological, solid state and theoretical photochemical themes with the aim of providing to phd students knowledge in basic principles and application of photochemistry.

Evaluation: NO

CFU / Hours

3 CFU - 24 Hours (Lecture)

Teaching period

II semester: from 2nd half of May till the end of July 2024

Sustainable Development Goals
