



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Introduction to Photochemistry (Curricular - Chemistry)

2122-94R-SCGA11

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#### Title

Introduction to photochemistry

#### Teacher(s)

Luca Bertini ; Federica Arrigoni; Claudio Greco ; Antonio Papagni

#### 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 phototocatalysis
- Photoinduced Electron transfer: Markus theory and quantum approach
- Energy transfer: Förster and Dexter mechanism
- *All-in-one* example:  $[\text{Ru}(\text{bpy})_3]^{2+}$  in electron-trasfer 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**

2 CFU - 16 Hours (Lecture)

### **Teaching period**

II semester

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