CH-426

# Artificial photosynthesis

Zakeeruddin Shaik Mohammed

| Cursus | Sem. | Type |
|---|---|---|
| Chimiste | MA1, MA3 | Opt. |

| | |
|---|---|
| Language of teaching | English |
| Credits | 2 |
| Session | Winter |
| Semester | Fall |
| Exam | Oral |
| Workload | 60h |
| Weeks | 14 |
| **Hours** | **2 weekly** |
| Lecture | 2 weekly |
| **Number of positions** | |

## Summary

This class is intended to make students familiar with dye sensitized solar cells. It presents the principle of design and rationalize the influence of various components on the power conversion efficiency of solar cells.

## Content

Design and synthesis of efficient sensitizers for DSC and the influence of ligands on the energetics of sensitizers in tuning the spectral response.
Laser flash photolysis studies to understand the kinetic aspects of DSC, dye regeneration and recombination processes.
Solar conversion efficiency measurements and analysis of devices with electrochemical impedance spectroscopy.
Interface engineering by using co-adsorbing molecules to passivate the surface states. Influence of surface modification on the fermi level of titania and the photovoltaic performance of devices.
Various types of redox electrolytes will be discussed, emphasizing more on the iodide triiodide redox couple. The role of solvents on the performance of device and the use of solvent free ionic liquid electrolytes in DSC.
Design and synthesis of efficient light absorbers for Perovskite solar cells (PSCs). Tuning the band gap energies and spectral properties of perovskite light absorbers.

## Learning Outcomes

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

- Describe operating principle of dye solar cell
- Design photovoltaic sensitizer
- Compare different redox electrolytes
- Discuss effect of different parameters to enhance PV performance
- Optimize dye, electrolyte combinations
- Investigate influence of additives in electrolytes on device parameters
- Describe various perovskite solar cell architectures
- Predict the spectral response of the sensitizers by variying the ligand stregth.
- Explain how we can tune the band gap energy of organo matalic perovskites.

## Teaching methods

Ex-cathedra class

## Assessment methods

Oral examination

## Supervision

| | |
|---|---|
| Office hours | No |
| Assistants | No |
| Forum | No |

## Resources

### Notes/Handbook

Notes will be distributed