

CH-426

**Artificial photosynthesis**

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<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
Chimiste	MA1, MA3	Opt.

Language of teaching	English
Credits	2
Session	Winter
Semester	Fall
Exam	Oral
Workload	60h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Lecture	2 weekly
<b>Number of positions</b>	

**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 varying the ligand strength.
- Explain how we can tune the band gap energy of organo metallic 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