

CH-435

**Asymmetric catalysis for fine chemicals synthesis**

Waser Jérôme

Cursus	Sem.	Type
Chemistry and Chemical Engineering		Obl.
Chimiste	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Oral
Workload	90h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Courses	2 weekly
<b>Number of positions</b>	

**Summary**

The asymmetric synthesis of fine chemicals is a research topic of growing importance for the synthesis of modern materials, drugs and agrochemicals. In this lecture, the concepts of asymmetric catalysis for fine chemical synthesis are introduced.

**Content**

In the context of a more sustainable chemistry, the development of catalytic methods is especially attractive and has already led to two Nobel prizes in the past. In this lecture, the concepts of asymmetric catalysis for fine chemical synthesis are introduced. The most important processes established or currently under investigation internationally and in the research groups of EPFL are presented, focusing on the fundamental understanding of catalysis and organic transformations, and the sustainability assessment of the transformations. Recent research articles are regularly discussed and analyzed in the class. This lecture is one of the pillars of modern advanced education in synthetic organic chemistry, together with the lectures structure and reactivity (CH-432), total synthesis of natural products (CH-438) and physical and computational organic chemistry (CH-431).

**Structure:**

1. Concepts and principles of asymmetric catalysis and the sustainable synthesis of fine chemicals
2. Asymmetric activation of electrophiles with Lewis and Brønsted acids.
3. Asymmetric activation of nucleophiles with metal- and organo-catalysts.
4. Dual activation with acid-base, metal-base, metal-metal and single metal systems.
5. Umpolung of the reactivity.

**Keywords**

Catalysis  
Sustainability  
Fine Chemicals  
Enantioselective  
Organic Synthesis

**Learning Prerequisites****Recommended courses**

Good knowledge in organic chemistry is recommended (for example corresponding to EPFL lectures organic reactions and fonctions I-III, asymmetric synthesis, retrosynthesis, structure and reactivity, or similar lectures in other institutions). Basic knowledge in organometallic chemistry and coordination chemistry is also recommended.

**Learning Outcomes**

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

- Elaborate on the concepts of sustainability, catalysis and stereinduction described in a recent publication
- Formulate in details the following points in a publication: type of reaction, principle of reactivity, catalytic activation, asymmetric induction and full catalytic cycle
- Critique the content of a recent publication in the context of the knowledge in the field and the potential to develop more sustainable processes

### Transversal skills

- Access and evaluate appropriate sources of information.
- Make an oral presentation.
- Summarize an article or a technical report.
- Take feedback (critique) and respond in an appropriate manner.
- Communicate effectively, being understood, including across different languages and cultures.

### Teaching methods

ex cathedra presentation with summary and literature presentations of recent research publications by the students

### Assessment methods

Oral exam of 20 min, with 20 min preparation (recent publication) for 80% of the grade

Two oral presentations during the lecture counting for 20% of the grade.

### Resources

#### Notes/Handbook

power point presentation without details, need to be completed during lecture (the students will receive the slides in advance)

#### Moodle Link

- <https://go.epfl.ch/CH-435>

#### Videos

- <https://mediaspace.epfl.ch/channel/CH-435+Catalytic+asymmetric+reactions+in+organic+chemistry/29624>