

CH-427

Chemistry of f elements

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

Language of teaching	English
Credits	2
Session	Summer
Semester	Spring
Exam	Written
Workload	60h
Weeks	14
Hours	2 weekly
Courses	2 weekly
Number of positions	

Summary

The course will provide a synopsis of the chemistry of f elements (lanthanides and actinides) covering structure, bonding, redox and spectroscopic properties and reactivity. The coordination and organometallic chemistry of these ions will be discussed with an overview of their main applications.

Content

- Definition and origins
- Basic properties
- Spectroscopic properties and luminescence
- Magnetic properties
- Coordination chemistry
- Organometallic Chemistry
- Application of Gd in Magnetic Resonance Imaging
- Application of Lanthanide Luminescent properties
- Applications of lanthanides in catalysis and organic synthesis
- Application of actinides: from nuclear industry and environmental concerns to small molecule activation and molecular magnets

Keywords

coordination chemistry-organometallic chemistry-luminescence-magnetism-MRI contrast agents-lanthanides-actinides-small molecule activation

Learning Prerequisites**Recommended courses**

Coordination chemistry; Organometallic chemistry

Important concepts to start the course

Basic principles of coordination chemistry (geometries, bonding, hard-soft theory, basic crystal field theory) knowledge of simple ligands

Learning Outcomes

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

- Recall the most important geometries and oxidation states of f elements
- Recall the most important applications of f elements

- Predict stabilities of compounds with respect to ligand dissociation, hydrolysis, oxidation and disproportionation
- Predict reactivity of organometallic compounds
- Discuss spectroscopic and magnetic properties
- Categorize the different reactions of organometallic compounds
- Predict reaction pathways
- Design coordination compounds with specific properties

Teaching methods

Lectures
Exercices

Expected student activities

Attendance of Lectures with active participation
completing exercices during courses

reading written material and discussing during courses

Assessment methods

Written Exam
Assesment during exercices

Supervision

Office hours	No
Assistants	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

The f elements , N. Kaltsoyannis and P. Scott Oxford Chemistry Primers
Lanthanide and Actinide Chemistry , Simon Cotton, Wiley
d and f block chemistry, Chris Jones, RSC tutorial chemistry texts

Ressources en bibliothèque

- [Lanthanide and actinide chemistry / Cotton](#)
- [d- and f-block chemistry / Jones](#)
- [The f elements / Kaltsoyannis](#)

Notes/Handbook

Slides on Moodle

Moodle Link

- <https://go.epfl.ch/CH-427>