

CH-447

**Advanced materials for photovoltaics and lighting**

Nazeeruddin Mohammad Khaja

Cursus	Sem.	Type
Chimiste	MA2, MA4	Opt.
Photonics minor	E	Opt.

Language of teaching	English
Credits	2
Session	Summer
Semester	Spring
Exam	Oral
Workload	60h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Courses	2 weekly
<b>Number of positions</b>	

**Summary**

The course is made up of the understanding of the use of advanced materials for Dye-sensitized Solar Cells, Semiconductor Nanoparticles (Q-dots) and Organic Light Emitting Diodes (OLED).

**Content**

The course is made up of the understanding of the use of advanced materials in a range of devices such as:

- Case Study 1: Dye-sensitized Solar Cells (12 hours, 6 weeks)
- Case Study 2: Perovskite Solar Cells (8 hours, 4 weeks)
- Case Study 3: Semiconductor Nanoparticles (Q-dots) for Solar Cells (4 hours, 2 weeks)
- Case Study 4: Organic Light Emitting Diodes (OLED's) (4 hours, 2 weeks)

**Learning Prerequisites****Required courses**

Basic knowledge on metal complexes and characterization

**Recommended courses**

Photochemistry II, by Moser Jacques-Edourd

**Important concepts to start the course**

The main focus of the course "Advanced Materials for Photovoltaic and Light Emitting Applications" is to train students to understand properties of these materials at Molecular level. The course inspires students to go for doctoral studies and find solutions to the energy and environment issues. The student's benefit from this course, which is a result of 20 years intense research consisting of 25 scientists and deals with:

- Controlling of photo-physical, photo-chemical and electrochemical properties of metal complexes
- Chemistry of Sensitizers for dye-sensitized solar cells
- Creating directionality in the excited state of the sensitizers
- Tuning of absorption and Emission spectral properties of triplet emitters
- Controlling quantum yields and excited state lifetime
- Various characterization techniques and applications

This course has a direct relevance to the society's need of solving global warming and other pertinent issues

**Learning Outcomes**

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

- Conduct Controlling of photo-physical, photo-chemical and electrochemical properties of metal complexes, Chemistry of Sensitizers for dye-sensitized solar cells, Creating directionality in the excited state of the sensitizers, Tuning of absorption and Emission spectral properties of triplet emitters, Controlling quantum yields and excited state lifetime.
- Investigate The course inspires students to go for doctoral studies and find solutions to the energy and environment issues.
- Characterize Various characterisation techniques and applications
- Dimension This course has a direct relevance to the society's need of solving global warming and other pertinent issues

### Expected student activities

Literature search, and discuss most interesting publications related to photovoltaic and Light emitting applications

### Assessment methods

10 minutes preparation time, 15 minutes Oral presentation and 5 minutes questions including expert.

### Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

### Resources

#### Bibliography

Provide most recent and pertinent literature references.

#### Notes/Handbook

Course will be provided online

#### Websites

- <http://gmf.epfl.ch>

#### Moodle Link

- <http://gmf.epfl.ch/page-118611-en.html>