UNIVERSITÀ DEGLI STUDI DI TORINO

ID

VP114_DIP_CHIM

Visiting Professor Program
Academic year 2022/2023

TEACHING COMMITMENT: 24 hours

COURSE TITLE

Materials in optoelectronic applications for energy generation

TEACHING PERIOD

1st term

SCIENTIFIC AREA

Chemistry and Material Science

LANGUAGE USED TO TEACH

English

COURSE SUMMARY

Functional organic materials are nowadays at the forefront of research in many technological applications and in some cases, they have already entered the market. Within this module, the use of innovative organic and hybrid materials will be reviewed in their application in advanced optoelectronic devices for energy generation. Sensitized photovoltaic cells using organic and organometallic dyes, totally organic solar cells, perovskite-based and tandem solar cells will be described.
Structure-property relationships between the materials and their performances in the devices will be discussed.

LEARNING OBJECTIVES

The teaching is part of the general objective of the course to provide knowledge and skills in the field of organic, polymeric and hybrid materials for smart applications, with particular reference to the knowledge and understanding of the role of the material's design in the device performances.
Specifically within this module learning objectives are:
- Ability to foresee and understand the role of each functional material within a specific smart application;

- Understand the functional principle of the studied devices and how they are related to technologically meaningful fields.

TUTORSHIP ACTIVITIES

The Visiting Professor may be tutor or co-tutor in the presentation of graduate students thesis work.

LAB ACTIVITIES

The involvement of the Visiting Professor in the research activity of the Functional Organic Materials of the Department of Chemistry is encouraged.

OTHER ACTIVITIES BESIDES THE COURSE

The teaching activity will be deepened in a course (8 hours) for PhD students

Title: Materials in optoelectronic applications for energy generation: Nanomaterials

ADDITIONAL COURSE

COURSE TITLE

Organic/hybrid interphase phenomena

TEACHING PERIOD

2nd term

SCIENTIFIC AREA

Chemistry and Material Science

LANGUAGE USED TO TEACH

English

COURSE SUMMARY

The surface is the link between a body and the environment. As such, the surface is the place where many physical and chemical phenomena take place, and in many cases determine the behaviour of the material in practical applications.

The main objective of this module is to gain an understanding of the main phenomena occurring at the surfaces between organic and hybrid materials, merging physical and chemical concepts. Details on some specific applications, especially related to the energy field, will be discussed..

LEARNING OBJECTIVES

The teaching is part of the general objective of the course to provide knowledge and skills in the field of surface

phenomena.

In particular the objectives to be reached are:

Ability to foresee and understand the physics of surface phenomena in organic and hybrid materials

Understand the surface chemistry of different categories of organic materials and how it is related to the technologically important fields like renewable energy generation

TUTORSHIP ACTIVITIES

The Visiting Professor may be tutor or co-tutor in the presentation of graduate students thesis work.

LAB ACTIVITIES

The involvement of the Visiting Professor in the research activity of the MOF and SURFIN groups of the Department of Chemistry is encouraged.

OTHER ACTIVITIES BESIDES THE COURSE

N/A

VISITING PROFESSOR PROFILE

Multidisciplinary expertise in material science, physical chemistry, photo-electrochemistry, material electrochemistry, and renewable energy system. Experience in the optoelectronic characterization of materials, interface, and surface.
Expertise and experience in applications including optoelectronic applications, photoelectrochemistry, and electrochemistry in particular, emerging photovoltaics (Hybrid heterojunction solar cell, Dye-sensitized solar cell, Perovskite solar cell, Quantum dot solar cell, ETA solar cell, Tandem solar cell), and photoelectrode for water splitting.

CONTACT PERSON AT THE DEPARTMENT

Prof.ssa Claudia Barolo
claudia.barolo@unito.it