Introduction to Organic Optoelectronics

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COURSE DESCRIPTION:

The course gives a general introduction to organic optoelectronic materials and devices; both light-emitting (OLEDs), and light-harvesting (organic solar cells and photodetectors). The course starts with a brief introduction to OLEDs as a general platform for defining key aspects in organic optoelectronic devices. Aspects of material and device physics related to the operation and performance of these devices, such as; electronic structure of organic molecules (unit 2), key photophysical processes in organic molecules (unit 3); and exciton processes in organic solids (unit 4), are covered. Finally, an overview of organic light harvesting device is provided (unit 5)

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COURSE/TEACHING OBJECTIVES:

This course will help students with no or limited prior background in the field to:

- Acquire a general background in the field of organic optoelectronics, basic theory, applications, challenges, key developments, etc.
- Know and understand relevant fundamental scientific theory (qualitatively), and its relationship to organic optoelectronic material and device design concepts.
- Become familiar with relevant terminology, and be able to read and understand scientific literature in the field.

SYLLABUS:

01. Introduction to OLEDs
    OLED operation mechanism: injection, transport and emission of light, Organic heteojunction, General comparison of inorganic versus organic devices
02. Electronic Structure of Organic Molecules
    Molecular Orbitals, LCAO, Bonding and antibondig orbitals, Orbital hybridization, HOMO and LUMO levels, Conjugated Molecules
03. Photophysics of Organic Molecules
    Excited states: (Absorption and emission, Singlet and triplet states), Rates of electronic transitions, Transition moment, Frank Condon Principle, Radiative and non-radiative transitions, Excited state kinetics
04. Exciton Processes in Organic Solids
    Excitons, Forester and Dexter energy transfer, Exciton quenching processes. Electron transfer. Photoconductivity.
05. Organic Light Harvesting Devices
    Photodetector and Photovoltaic Devices: General background, device operation mechanism and characteristics, important phenomena, current challenges, key developments

SCHEDULE:

All courses will be given in the amphitheatre of the Institut de Chimie de la Matière Condensée de Bordeaux (ICMCB) 87, avenue du Docteur Albert Schweitzer.

Dates	Main Topics
Tuesday the 29th of may, 2-5 pm	01. Introduction to OLEDs 02. Electronic Structure of Organic Molecules
Monday the 4th of june, 2-5 pm	03. Photophysics of Organic Molecules
Monday the 11th of june, 2-5 pm	04. Excitonic Processes in Organic Solids
Wednesday the 20th of june, 2-5 pm	05. Organic Light Harvesting devices