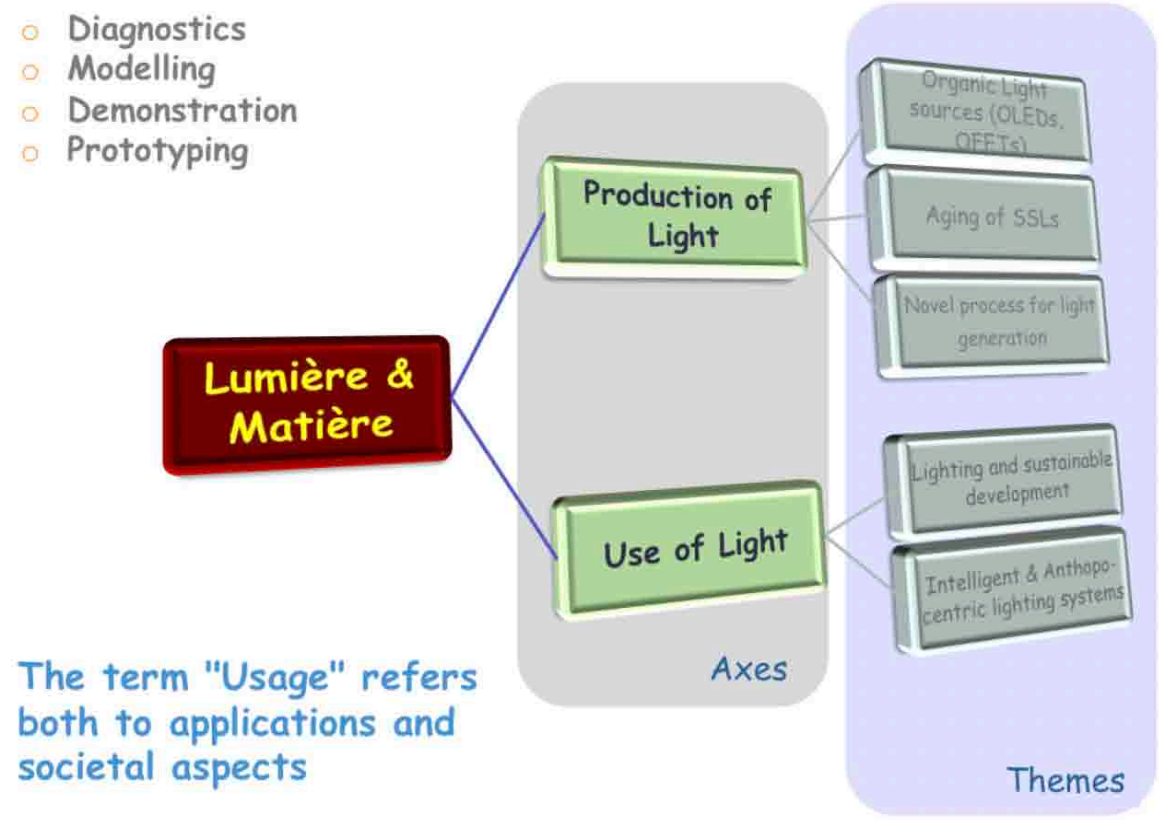
Description of "Lumière et Matière" (L&M) group of LAPLACE laboratory

Seminar January 15th, 2021

The Light & Matter research group is working on the production and use of light. Our research themes are centered around the science and technology of light sources and lighting systems as well as the study of the uses of light and its interactions with the environment and society. The themes of the group are inseparable from the applications. Although our activities are strongly linked to applications, they do not neglect fundamental aspects in the field of energy conversion materials and systems, and to a lesser extent in the field of electric discharge physics for lighting.

In all our actions, we favor a holistic approach to the system. The group's strategy consists in understanding the functioning of a complex system, studying its components and their interactions, with the ultimate objective of optimizing the system according to its application and use. To perfect this optimization, we call upon our competences in modeling, in diagnosis, without neglecting the prototyping and the demonstration on a large scale.

The following graphics summarize our axis of activity and thematic:



L&M group is dealing with experiment and simulation and it is able to create prototypes as well as large-scale demonstrators.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857061.

Experimental platforms

Organic electronics: Platform for the production and characterization of organic luminescent components (OLEDs, OLECs, OFETs). It consists of 3 "dry" glove boxes including small-molecule vacuum evaporation systems, RF-sputtering for the production of transparent electrodes and a box for the electrical and spectrophotometric characterization of the components. The device is supplemented by a "wet" installation allowing the spin-coating and treatments in liquid phase (polymers). The production set-up is coupled with characterization tools: Raman microscope, AFM/KFM, near-field optical microscope, micro-pin test station coupled with V(I) measure facilities and kelvin probe. Further, at LAPLACE level additional equipment like Photolithography, ellipsometry, profilometry, eln-microscope… is accessible. A white room is also accessible in LAPLACE as well as in LAAS laboratory inside the campus.

Light Sources spectrophotometric characterization platform: Spectrophotometric (from 200 nm to 1000nm) qualification platform that includes: spectroscopic experimental set-ups for emission and absorption spectroscopy (2 ultra-high and several lower resolution spectrometers; a fast CCD camera (2 ns aperture time, 20 kHz max sampling frequency); a close-field goniometer on table and a far-field class B goniometer for photometric studies; a series of integrating spheres adapted to various light sources (including two 1.8m diameter devices); all necessary portable equipment for in-situ measurements (spectroradiometers, luminance and illuminance-meters, video-photometer, spectro-luminance and spectro-illuminance meters, etc.)

Solid state lighting components aging platform: LM group has a bench dedicated to the LED components and a second one dedicated to OLEDs. Both benches allow the testing of components under thermal and/or electrical stress. The two set-ups were developed and realized in the LAPLACE laboratory. The bench dedicated to LEDs has four groups of components of different technologies. Each group is composed of 32 samples; a total of 128 LEDs is subjected to aging. The bench dedicated to OLEDs is composed of 4 groups of 4 OLEDs each. Each group is submitted to a different temperature and each sample of the group has a different current. The components are electrically characterized to obtain the I(V) curve using the meter sources and C(V) using a SOLARTRON impedance spectrometer and also spectroscopically to determine the drift of their colorimetric characteristics.

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