Mini-symposium on Weakly and Strongly Coupled Materials
ISIS Conference room, 22/09/2022

14:00 Extended hybridization and energy transfer in multimaterial polaritonic metasurfaces

Prof. Joël Bellessa, University of Lyon

Abstract: In this talk we propose a new way to hybridize two organic materials and transfer energy through a surface plasmon over micrometric distances. For this purpose, two patterned interlocked dyes arrays, one donor and one acceptor, are deposited on a silver surface by successive micro contact printing, leading to a pattern of 5 microns in period. The mixing in these polaritonic metasurfaces enables an energy transfer mechanism in strong coupling, which is observed with luminescence experiments. The transfer from one material to the other in strong coupling over micrometric distances could find applications in the excitation of organic devices with an efficient transfer and an easy access to the in-plane separated structures.

14:45 Entangling Electromagnetic Modes by Mutual Coupling with Molecules

Prof. Tal Schwartz, University of Tel Aviv

Strong light-matter coupling typically occur when a optical transition in materials, such as molecules, interact coherent with a single electromagnetic mode of an optical resonators. Here I will discuss a different scenario, in which several modes interact simultaneously with the material. As I will show, such a system can exhibit a transition between two drastically different types of strong coupling, in which the modes are either individually coupled to the material, or intermixed with each other via the light-matter interaction.

15:30 Coffee Break

15:45 Molecules in optical cavities: Electron transfer and transmission, Polaritons, vibrational strong coupling and collective response

Prof. Abraham Nitzan, University of Pennsylvania

Abstract: I will give short accounts of our recent works on (a) strong coupling effects in molecular electron transfer (b) Manifestations of vibrational strong coupling as observed in classical numerical simulations and (c) Implications of nuclear motion and vibronic coupling on molecular electronic strong coupling phenomena.

16:30 Opportunities for optoelectronics with colloidal nanocrystal assemblies weakly coupled to their environment

Dr. Aloyse Degiron, University of Paris Cité

Abstract : Colloidal semiconducting nanocrystals offer attractive opportunities for optoelectronics. They can self-assemble into solid compact layers and their properties can be adjusted with great flexibility to address frequency windows that are otherwise difficult and/or expensive to cover with standard semiconductors. In this talk, I will revisit the familiar properties of near-infrared PbS nanocrystal assemblies with systematic comparisons between their luminescence and absorption spectra. I will identify two regimes of carrier thermalization and show how the thermalized carriers govern our observations (such as the precise Stokes shift between absorption and emission, the shape of the spectra, the wavevector distribution…). Then I will use this insight to demonstrate unconventional optoelectronic devices in which ensembles of PbS nanocrystals are weakly coupled to tailored photonic environments, such as incoherent LEDs emitting light with broadband phase and/or polarization singularities.