Charge-imbalanced polaritons

Marchetti, Francesca Maria[1,*]

[1]*Departamento de Física Teórica de la Materia Condensada & Condensed Matter Physics Center (IFIMAC), Universidad Autónoma de Madrid, Madrid 28049, Spain*
**e-mail: Francesca.marchetti@uam.es*

Recent technological progress has led to precise and efficient manipulation of electronic and optical properties of semiconductor solid-state devices. Noticeable examples include GaAs heterostructures, while, more recently, transition metal dichalcogenide (TMDC) monolayers have emerged as ideal materials for optoelectronic devices. Crucially, these structures have been recently embedded into planar optical cavities, allowing to study the interplay between strong light-matter coupling and electronic doping. This opens the prospect to generate and control novel strongly correlated phases between exciton-polaritons and 2D electron system.

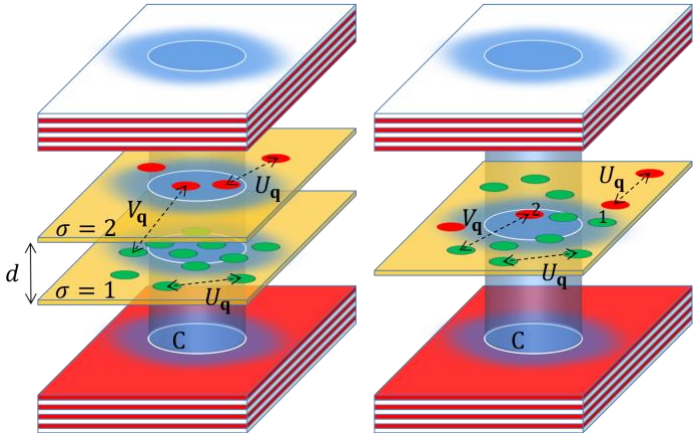

Fig. 1. Schematic representation of a charge-imbalanced bilayer (left) and single quantum well (right) embedded into a planar microcavity confining the photon mode.

In this presentation, I will consider a charge-imbalanced mixture of electrons and holes in either doped single quantum wells or bilayers, strongly coupled to a cavity mode (see schematic Fig.1). I will discuss the occurrence of different coherent phases following the competition between long-ranged Coulomb interactions, Pauli blocking and the strong coupling to light.