



Dipartimento di
Scienze Chimiche

Graduate Course in
**Materials Science and
Technology (MST)**



Dipartimento di Fisica e
Astronomia "G. Galilei"

Seminar

October 19, 2023 – 13:30

Aula B – Dept. of Physics and Astronomy "G. Galilei"

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Slowing down polaritons with flatbands in strongly coupled cavities



Strong coupling between photons and excitons within an optical cavity leads to the formation of new quasi-particles known as exciton-polaritons. Despite their inherent complexity, organic exciton-polaritons are commonly regarded as coherent excitations described by Landau's quasiparticle theory. We discuss the breakdown of Landau's quasiparticle picture for organic polaritons in the presence of molecular vibronic levels.

In the second part of the talk, we demonstrate room-temperature slow-light with Frenkel polaritons excited across two strongly coupled optical cavities. Slow light is signaled by the flattening of the middle polariton band upon hitting the condition for electromagnetically induced transparency. Our simple photonic architecture enables the unique spatial segregation of photons and excitons in different cavities while maintaining a balanced degree of mixing between them. This unveils a dynamical competition between many-body scattering processes and the underlying polariton nature revealed by an increased fluorescence lifetime in the nanosecond range. The polariton features are further investigated under appropriate resonant pumping, where we observe suppression of the flatband polariton fluorescence intensity.