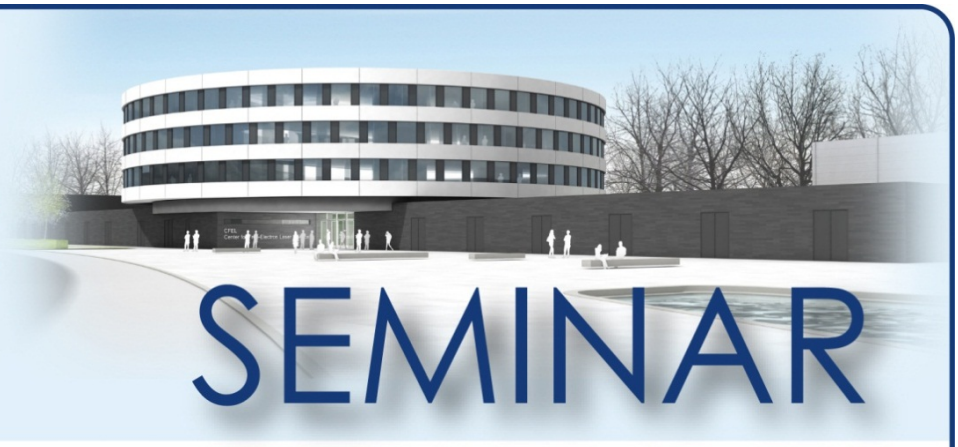
CFEL SCIENCE



SEMINAR

21st March 2018 - 2:00 p.m.

CFEL-bldg. 99, seminar room IV

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Polariton photophysics and photochemistry: theoretical perspectives

Organic molecules interact strongly with confined electromagnetic fields in plasmonic arrays or optical microcavities owing to their bright transition dipole moments. This interaction gives rise to molecular polaritons, hybrid light-matter quasiparticles. Molecular polaritonics opens new room-temperature opportunities for the nontrivial control of energy transport in the nano and mesoscales and modification of physico-chemical properties of molecular assemblies. In this talk, I'll showcase some of these opportunities that we have been theoretically exploring in the past few years within the context of physical chemistry. I'll start by briefly mentioning our work on topologically nontrivial phases in excitonic and polaritonic systems of organic dye molecules [1,2]. Next, I will discuss recent work on how polaritons can enhance singlet-fission processes [3] or how excitation energy can be transferred across mesoscopic distances of hundreds of nanometers to micron lengthscales [4]. If time permits, I'll conclude by explaining what we can learn about molecular polaritons using two-dimensional spectroscopy [5,6].

[1] J. Yuen-Zhou et al., Nature Mater. 13, 1026 (2014).

[2] J. Yuen-Zhou et al., Plexcitons: Dirac points and topological modes, Nat. Commun. 7, 11783 (2016).

[3] L. A. Martínez-Martínez, et al., Polariton-assisted singlet fission in acene aggregates, under review in J. Phys. Chem. Lett., arXiV:1711.11264.

[4] M. Du et al., Polariton-assisted remote energy transfer (PARET), under review in Chem. Sci., arXiv:1711.11576.

[5] B. Xiang et al., Revealing hidden vibration polariton interactions by 2D IR spectroscopy, under review in Proc. Nat. Acad. Sci., arXiv:1711.11222.

[6] R. F. Ribeiro et al., Theory for nonlinear spectroscopy of vibrational polaritons, submitted to J. Phys. Chem. Lett., arXiv:1711.11576.

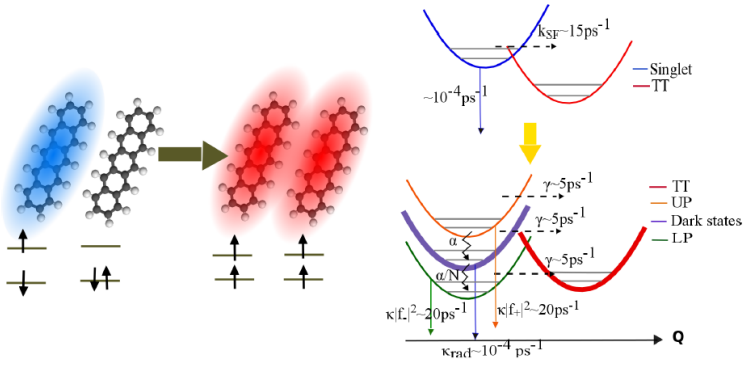

Figure: Polariton assisted singlet fission (from Ref. [3]).

Host: Angel Rubio – MPSD-CFEL Theory Department