USC Viterbi School of Engineering

Mork Family Department of Chemical Engineering and Materials Science

Wednesday, September 18, 2024

Understanding excitons in chemically and structurally heterogeneous semiconductors

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Abstract

In the first part of my talk, I will present our studies of exciton delocalization in several heterogeneous semiconductors belonging to the broader family of halide perovskites. I will discuss our recent analysis of optical excitations in quasi-two-dimensional (quasi-2D) organic-inorganic halide perovskites [1-3], and show how subtle structural features can significantly impact the delocalization of excitons in these systems. In the second part of my talk (time permitting) I will present a new methodological development that generalizes the Bethe-Salpeter equation (BSE) to include the impact of ionic vibrations on the dielectric screening of excitons [4,5], and show how this allows us to compute the rate of dissociation of an exciton upon scattering with phonons [6].

1. Filip, Qiu, Del Ben & Neaton, Nano Lett. 22 (12), 4870-4878 (2022).
2. Aubrey, Valdes, Filip, Connor, Lindquist, Neaton & Karunadasa, Nature, 597, 355-359 (2021).
3. Chen & Filip, J. Phys. Chem. Lett., 14, 10634-10641 (2023).
5. Filip, Haber & Neaton, Phys. Rev. Lett. 127, 67401 (2021).
6. Alvertis, Haber, Li, Coveney, Louie, Filip & Neaton, PNAS, 121, 30, e2403434121 (2024).
7. Coveney, Haber, Alvertis, Neaton & Filip, PRB, 110, 054307 (2024).

Biography

Marina Filip is an Associate Professor of Condensed Matter Physics at the University of Oxford and a Tutorial Fellow in Physics at University College, Oxford. Before joining the Oxford Physics faculty in February 2020, Marina was a postdoctoral scholar in the Physics Department at UC Berkeley and Lawrence Berkeley National Laboratory (2018-2020) and the Materials Department at the University of Oxford (2015-2018). Marina received her doctorate in Materials Science from the University of Oxford in 2016, and completed her undergraduate studies in Physics, at the University of Bucharest, Romania. Marina was recently awarded the 2024 IUPAP Early Career Scientist Prize in Semiconductor Physics, and is currently visiting Berkeley as a Somorjai Miller Visiting Professor.

2:00 – 3:00 PM, September 18th, 2024
Location: KAP 145 (Kaprielian Hall)

Host: Zhenglu Li