



Münchner Physik- Kolloquium

Winter
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Ultrafast spectroscopy of excited state dynamics in metal-halide perovskite semiconductors – novel functional materials for optoelectronics

Dr. Felix Deschler, *University of Cambridge, United Kingdom*

Monday, 5 November 2018, 17:15 h

Hörsaal 2, Physik-Department der TUM, James-Franck-Straße 1, Garching

Metal-halide perovskites have emerged as promising solution-processable semiconductors for optoelectronic applications. These materials show unexpectedly high luminescence yields and long carrier lifetimes under operating conditions. Facile changes in composition during fabrication can be used to control their optical properties, and the nature of electronic states. Recently, the admixture of monovalent cations to the precursor solution has been demonstrated to maximize the luminescence yields and device performance, which harvests photon-recycling effects that were demonstrated by us.

Fundamentally, the properties and dynamics of the perovskites' electronic states are controlled by their crystal structure and symmetry. Strong spin-orbit coupling was predicted to introduce Rashba-type state splitting in the electronic band structure. In combination with the soft crystal structure of the perovskite lattice, it is likely that dynamic changes occur in the electronic states during their lifetime. So far, it is not understood how such effects change after optical excitation and how they proceed during relaxation of electronic states.

In this talk I will present how we use advanced ultrafast spectroscopic techniques to study the dynamics of electronic states and crystal structure in metal-halide perovskites on ultrafast timescales, with focus on the generation of efficient luminescence. I will report results on layered and bulk lead-halide perovskites, and further on sustainable lead-free variants. I will discuss how the crystal structure of the materials controls the properties and recombination of electronic states, and how these enable novel optoelectronic devices and functionality.

Student event: Meet the speaker

We invite you to a **student-only** discussion-round with Dr. Felix Deschler before his Munich Physics Colloquium talk.

Be curious and feel free to ask any question.

Monday, 5 November 2018, 16:00 h

Seminar room PH 3268 (upper floor, new location!), Physik-Department der TUM, James-Franck-Straße 1, Garching

