DEUTSCHE GESELLSCHAFT FÜR ELEKTRONENMIKROSKOPIE

Program

3rd DGE Young Scientist Symposium

Thursday, Jan. 20th, 2022 from 14:00 to 15:30

Online using Zoom:

https://zoom.us/j/92504880687?pwd=cS9lY1ZNRUdNcFBaK2xBQVhrNkJoZz09

Zoom Meeting ID: 925 0488 0687 Passcode: 604985

14:00 Dr. Thomas Danz, Univ. Göttingen

Ultrafast transmission electron microscopy
of a structural phase transition

14:40 Dr. Sebastián Caicedo-Dávila, HZB Berlin

Phase coexistence and confinement effects
on the emission of Cs-Pb-Br composites

For abstracts please see next page.

Invited by the Board of the
German Society for Electron Microscopy DGE

Abstract of talk presented by Dr. Thomas Danz:

High hopes for future device applications are placed on optically tunable materials. Functionality, however, not only arises from properties of individual materials but also from their interplay and nanoscale structuring. Specialized experimental approaches are required to track relevant dynamics on their intrinsic time and length scales. Here, we report on the implementation of a time-resolved dark-field electron microscopy scheme at the Göttingen Ultrafast Transmission Electron Microscope (UTEM). By means of a tailored dark-field aperture array, we gain access to the order parameter in a structural phase transition in 1T-TaS2. After pulsed optical excitation, we observe the evolution of charge-density wave domains with femtosecond temporal and 5nm spatial resolution. Allowing for sensitivity to further degrees of freedom, our approach will enable novel types of ultrafast investigation.

Abstract of talk presented by Dr. Sebastián Caicedo-Dávila:

Halide perovskite-type materials have raised a lot of interest for photovoltaic and optoelectronic devices in recent years, owing to their rapid increase in power conversion efficiency. However, the appearance of secondary phases can affect the performance of these materials. Thus, it is important to understand their effects in detail. In the present work, we investigated phase distributions in the Cs-Pb-Br materials system, which exhibits three stable, ternary phases that can coexist. Combining optical and microscopic characterization, we probed the phase distribution and optoelectronic properties of the different phases, as well as their composites. In addition, we combined ab-initio calculations and effective-mass models of excitons to explain the light emission of various Cs-Pb-Br phases, providing evidence that green emission stems from embedded $CsPbBr_3$ nanocrystals. Our experimental-theoretical approach is a valuable tool to understand optoelectronic properties of Cs-Pb-Br beyond conventional models, which fall short at describing these systems.