



e-conversion



## **Seminar announcement**

**Monday, May 8, 2023**

**2 pm**

**WSI, Seminar room S 101**

### **“IR spectroscopy of perovskites – carrier cooling, electron-phonon coupling, and charge trapping dynamics”**

“Soft” semiconductors, like lead halide perovskites (LHP) are likely material candidates for the future cheap and efficient photovoltaic technologies. Carrier-carrier and carrier-phonon interactions in this system play dominant role but are still poorly understood. In my talk, I will present IR spectroscopy perspective on these aspects of LHP materials achieved by two different techniques.

First approach investigates the role of quantum confinement on carriers and carrier-phonon interaction via observation of hot carrier cooling in LHP nanomaterials using pump-push-probe spectroscopy. The results show that 2D systems exhibit a suppression of the hot phonon bottleneck effect, highlighting the impact of exciton formation on carrier cooling and promoting dimensional confinement as a tool for engineering carrier-phonon and carrier-carrier interactions in LHPs.

The second approach introduces novel spectroscopic techniques based on Vibrationally Promoted Electronic Resonance (VIPER) to demonstrate ultrafast vibrational control of FAPbBr<sub>3</sub> perovskite solar cells via intramolecular vibrations of the A-site formamidinium cation. The study shows that molecular rotations modulating the couplings between cations and halides can suppress nonradiative recombination in perovskite materials, offering an important insight for the development of new photovoltaics with reduced voltage losses.

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