

K 4: Poster Optische Verfahren

Zeit: Dienstag 16:30–18:30

Raum: GW2 2.OG

K 4.1 Di 16:30 GW2 2.OG

Multiscale transient absorption spectroscopy for global transport modelling of strongly-coupled carriers in oxide (nano-)materials — •JÖRG RISCHMÜLLER, JULIANE EGGERT, SVEN HOCHHEIM, SIMON MESSERSCHMIDT, and MIRCO IMLAU — School of Physics, University of Osnabrück, Germany

Strongly-coupled carriers - electron or hole small polarons, bipolarons or self-trapped excitons - are of increasing importance in oxide (nano-)materials due to their exceptional impact on photocatalysis and photovoltaics in the framework of carrier separation. The respective carrier transport dynamics are commonly accessed by means of transient absorption, transient luminescence and/or transient current spectroscopy using pump-probe techniques and ultrashort laser pulses.

To access relaxation lifetimes typically in the 10 - 100 nanosecond time regime, however, samples need to be cooled; thus, important insight to the room temperature photofunctionality is prohibited. We have addressed this problem by an extension of the classical optical pump-probe-technique by an electronic detection system together with a unique optical delay line covering the time regime from 100 fs to 40 ns. With rutile, TiO₂, single crystal as an example we demonstrate the possibility to investigate decay mechanisms over 14 orders of magnitude on the timescale, that enables global modelling of strongly-coupled carrier transport even at room temperature. Furthermore, we show the possibility to investigate oxide nanopowders introducing transient reflectance spectroscopy.