

Physikalisches Kolloquium Universität Kiel Wintersemester 2019/2020

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Dr. Sophie Meuret

CERMES - CNRS, Toulouse, France

Time resolved Cathodoluminescence from lifetime measurements to pump-probe luminescence

Cathodoluminescence has become one of the most powerful technique to study the optical properties of nanostructures at the nanoscale. With the development of a pulsed electron beam, it is now possible to access dynamical information. In the case of nanophotonic structures, time-resolved cathodoluminescence [1] has significantly broaden the accessible optical properties, reaching an almost full characterization of their emission properties at the nanoscale. For example, it is able to measure the lifetime of excited states [2] or the speed of the diffusion of charge carriers [3]. However, we are still unable to assess the influence of electron excitation on the nanostructure optical properties or to measure the local absorption properties of light. In this presentation we will show that pump-probe luminescence experiment has allow us to go beyond standard time-resolved cathodoluminescence measurement. In pump-probe luminescence, a pulsed electron beam and a pulsed laser beam excite the sample with a controlled delay between the two excitations, and we collect both the cathodoluminescence and photoluminescence signals. In a pump-probe experiment, we observed the relative change of the luminescence spectrum when both light and electrons illuminate the sample compared to when only one or the other is present. I will show how, thanks to this experiment, we can measure, at the nanoscale, the effect of electron interaction on the optical material properties (quenching or enhancement) [4] and the local light absorption properties.

[1] M. Merano *et al.*, *Nature*, vol. 438, no. 7067, pp. 479–82, Nov. 2005.

[2] P. Corfdir *et al.*, *J. Appl. Phys.*, vol. 105, no. 4, p. 043102, 2009.

[3] M. Shahmohammad *et al*, *Appl. Phys. Lett.*, vol. 107, no. 14, p. 141101, 2015.

[4] M. Solà-Garcia *et al*, *ACS Photonics*, *asap*, (2019)

Der Vortrag beginnt um **16:15 Uhr** im **Hans-Geiger-Hörsaal (LS13-R.52)**
des Physikzentrums.

Ab **16:00 Uhr** werden **Kaffee** und **Tee** angeboten

Bitte Becher mitbringen!