TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Physics

PHYSICS COLLOQUIUM

Speaker: **Dr. Sebastian Schellhammer**
Institut für Angewandte Physik, Fakultät Physik
TU Dresden

Topic: **Elevating the performance and application of organic persistent emitter materials (and promoting research-oriented teaching and learning)**
Introduction for habilitation

Time and place: Tuesday, June 24, 2025, **2:50 pm** – hybrid event
The colloquium will be held in REC/C213.
Online participation possible:
Zoom-Meeting: Meeting-ID: 631 3817 8900 / passcode: PC-SoSe25
https://tu-dresden.zoom-x.de/j/63138178900?pwd=TlmGawPz1dtDA6VzO2N1XdqqI7bE6b.1

Host: Prof. Sebastian Reineke

Abstract: Photonic and optoelectronic devices benefit significantly from purely organic emitters with efficient delayed emission. While thermally activated delayed fluorescence (TADF) provides a strategy for triplet harvesting in organic light-emitting diodes (OLEDs) and is a cornerstone for hyperfluorescent material systems, room-temperature phosphorescence (RTP) allows the design of minimalistic yet powerful devices, so-called programmable luminescent tags (PLTs), for information storage, sensing, and security features. In both cases, there is a high effort to find new, improved materials, which is, however, hindered by an inadequate understanding of the structure-property relationships especially embedded in host materials. In my talk, I present our recent effort to synergistically complement experimental analysis and multiscale materials simulations for the understanding of organic emitter systems, the relevance of dynamic and intermolecular effects, and the development of new applications. Efficient RTP and TADF emitter materials regularly follow the donor-acceptor-donor design motif. By systematically varying the donor and acceptor moieties, better performing emitters and shifts in the emission wavelength could be realized to allow extended application of PLTs. Using quinoline alkaloids as natural RTP emitters and polylactic acid as both matrix material and flexible substrate, industrially compostable PLTs could be developed that exhibit all the function-determining features also found in their conventional analogs. Despite their promising performance, they demonstrate that

biodegradability comes at the price of reduced stability. However, the development of smart technological solutions does not necessarily mean full functionality, but exactly the functionality required for the task in question following a minimalistic, sustainable design.

Bio: 2020 PhD on multiscale materials simulations of organic semiconductors in the groups of Frank Ortmann and Gianaurelio Cuniberti, 2017 – 2019 project coordinator in higher didactics and 2019 – 2022 coordinator of the liaison office for teacher education, since 2022 group leader in the Reineke group – all at TU Dresden. Winner of several teaching awards: 2015 & 2025 Teaching Award of the Association of Friends and Sponsors of TU Dresden, 2025 Ars Legendi Fakultätenpreis Physik.