TECHNISCHE UNIVERSITÄT DRESDEN

Bereich Mathematik und Naturwissenschaften Fakultät Physik

DRESDNER PROMOTIONSPREIS PHYSIK 2021

Program:

- Opening: Dean of the Faculty of Physics, Prof. Dr. Carsten Timm
- Laudation: Chair of the Prize Committee, Prof. Dr. Jan Budich
- Laureate Lecture: Dr. Max Gmelch

Time and Place:

Tuesday, 23.11.2021, 16:40 // Virtual prize ceremony in **Zoom**

Meeting-ID: 830 0451 0136 // Kenncode: PK21!-MG
https://tu-dresden.zoom.us/j/83004510136?pwd=L0RLSWxWWXhZSjg0QWlVZklzZ3ZnZz09

Lectures:

Dr. Max Gmelch

From Quantum Mechanical Restrictions to Everyday Applications: Programmable Tags using Organic Phosphorescence

Organic phosphorescence at room temperature is a strongly growing field of research. Together with fluorescence, it describes the radiative transitions of organic molecules after excitation with light of appropriate wavelength. While fluorescence is a process on the nanosecond timescale, organic phosphorescence is known to show afterglow emission in the lifetime range of microseconds to seconds. In recent years, the number of publications introducing new organic phosphorescent emitters has continuously increased. However, to that date, the high quantity of described materials is not matched by an adequate number of proposed applications. In fact, most publications present the synthesis of the substances as well as the morphology of the system, but only briefly address possible subsequent developing steps. In this talk, a newly detected photophysical effect is introduced, which enables the reversible activation of phosphorescence in a thin and transparent film. Since for many emitter materials the presence of adjacent molecular oxygen leads to a complete vanishing of phosphorescence, this emission can locally be tuned by manipulating the respective oxygen concentration. In detail, radiation in the near UV or blue regime can induce a chemical reaction of the oxygen and its environment, leading to an oxygen depletion at the illuminated regions. By covering the system with suitable barrier layers, no fresh oxygen can refill the system and phosphorescence becomes visible at the respective areas. By that, any luminescent image can be programmed into the transparent layers and be read out on demand.

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