TECHNISCHE UNIVERSITÄT DRESDEN

Bereich Mathematik und Naturwissenschaften Fakultät Physik

PHYSIKALISCHES KOLLOQUIUM

Vortrag:

Prof. Dr. Ludvig Edman
The Organic Photonics and Electronics Group,
Umeå University,
Sweden

Thema: **Towards sustainable and efficient light-emitting electrochemical cells**

Zeit und Ort: Dienstag, 26.10.2021, 16:40 Uhr
Online-Meeting: BBB / Zugang mit Browser (Firefox oder Chrome)
- Teilnehmende mit ZIH-Login über folgenden Link:
https://selfservice.zih.tu-dresden.de/l/link.php?m=154232&p=0490bc11
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Leitung: Prof. Dr. Sebastian Reineke

Kurzfassung:

The light-emitting electrochemical cell (LEC) features mobile ions in the active material, and it is the action of these ions that distinguishes the LEC from other light sources such as the OLED, and which enables for its attractive properties. Notably, it is possible to fabricate LECs from solely air-stabile materials and employ a thick single layer as the active material. These attributes promise to pave the way for an unprecedented low-cost fabrication, and functional LECs has been fabricated by slot-die and spray coating on a variety of substrates - including paper, metal, and textile - under uninterrupted ambient-air conditions. The redistribution of the mobile ions causes electrochemical doping (p-type at the anode and n-type at the cathode), so that a light-emitting p-n junction forms at steady-state. It is this in-situ formed doping structure that allows for the low-cost fabrication, but at the same time poses a significant challenge from both a conceptual and performance perspective. For instance, the doping regions comprise high concentrations of electron and hole polarons, and their interaction with excitons formed in the p-n junction can result in severe exciton quenching. Thus, it has been questioned whether LECs ever can be efficient at strong light emission. However, it was recently demonstrated that this issue can be alleviated by a rational device design, and single-layer LECs with air-stabile electrodes (and void of outcoupling structures) have been developed that deliver strong and efficient triplet and TADF luminance (current record: 1900 cd/m^2 at an external quantum efficiency of 12 %).

Biographie: Professor Ludvig Edman received his PhD in Physics from Umeå University, Sweden, in 2001, and thereafter spent a three-year postdoctoral stint at University of California at Santa Barbara. His research interests include the development of functional and novel electronic and electrochemical devices, of which the light-emitting electrochemical cell (LEC) has been at the focal point for more than a decade. Edman has published more than 120 papers in peer-review scientific journals, and is the inventor on ten submitted or accepted patents. He is also a founding owner of the company LunaLEC, which is dedicated to the commercialization of the LEC technology.