

DS 51: Organic Electronics and Photovoltaics II (jointly with CPP, HL, and O)

Time: Thursday 12:00–13:00

Location: GER 38

DS 51.1 Thu 12:00 GER 38

Improving the performance of phosphorescent light-emitting electrochemical cells without sacrificing stability

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Within the past few years a novel class of solution-processable solid-state organic light-emitting devices referred to as light-emitting electrochemical cells (LECs) has attracted considerable interest. Key feature of these devices is the existence of mobile ions within the active layer, which enable in-situ electrochemical doping with subsequent formation of a light-emitting p-n-junction. Due to their simple architecture and the use of air-stable electrodes LECs are regarded as an attractive approach for flexible large area lighting applications.

To compete with state of the art lighting technologies, however, the overall device performance of LECs has to be improved. For this purpose, an optimization of the device configuration and processing conditions as well as the use of a proper driving mode can be helpful. We show that the performance can be significantly enhanced due to modifications in the stack configuration (e.g. interfaces, layer thickness, cathode), processing conditions and by an adequate mode of operation without any losses in the device stability.

DS 51.2 Thu 12:15 GER 38

OLEDs under high current densities – transient electroluminescence turn-on dynamics and singlet-triplet quenching

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Organic solid state lasers have been intensively studied during the last decade due to the promising combination of versatile organic materials with the advantages of solid state emitters. Even though various optically pumped devices comprising different resonator types and material combinations have been shown, direct electrical pumping has not been achieved yet. The high excitation density needed in the active layer to achieve inversion is easily created by pulsed optical pumping, but additional losses prevent the excitation to reach the critical point when driven electrically.

To estimate the dimensions of these additional losses, we investigate full pin-OLEDs comprising the singlet emitter system DCM doped into Alq3 under high current densities. With the OLED active area reduced to $100 \times 100 \mu\text{m}^2$, these devices sustain current densities in the order of kA/cm^2 in pulsed operation. The results of time resolved

electroluminescence (EL) measurements as well as power dependent emission spectra give promising insight into the behaviour of OLEDs under these extreme excitation conditions. Intense EL transient turn-on peaks on the nanosecond time scale can be explained by modelling the singlet and triplet population taking into account singlet-triplet and triplet-triplet quenching in the emission layer.

DS 51.3 Thu 12:30 GER 38

Investigation of the chemical and electronic structure of F₁₆CoPc from Monolayer to thick films by photoemission spectroscopy

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We have grown F₁₆CoPc with different film thickness under ultra high vacuum conditions on polycrystalline Au surfaces. By means of combined X-ray and ultraviolet photoemission spectroscopy (XPS, UPS) we have investigated the chemical and electronic structure of the F₁₆CoPc films. Within the first monolayers we could identify a charge transfer from the substrate on the F₁₆CoPc molecules. Our results indicate a clear difference in the valence band spectra for sub-monolayer thin and several nm thick F₁₆CoPc films. Furthermore, for F₁₆CoPc the ionization potential can be changed by the fluorination of the molecules from 4.8 eV for CoPc to 6.5 eV for F₁₆CoPc. The investigated heterointerface CoPc/F₁₆CoPc can be characterized as free from chemical reactions.

DS 51.4 Thu 12:45 GER 38

Influence of sample geometry and contact metal on the characteristics of organic field-effect transistors

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Thin films of F₁₆PcCu were prepared by physical vapor deposition on μ -structured electrode arrays of different contact metals. I/V -measurements of structures with various channel lengths showed a nonlinear injection of charge carriers for low Source-Drain-Voltages V_{DS} . Such behavior was especially found for μ -structures of small channel length indicating an influence of the contact behavior at the interface between metal electrode and organic semiconductor channel. A model was developed based on different aspects of an injection barrier, channel resistance and a parameter characterizing the geometry of the conducting channel which were separately used in the literature before. The model was used to determine the charge carrier mobility also for low values of V_{DS} and consistent values with those from typically evaluated large V_{DS} in the saturation regime were obtained. Implications for technical applicability of such transistors and general validity of such model are discussed.