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Investigation of ZnO scattering layers for OLED applications

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Organic light emitting diodes (OLED) are reaching inner quantum efficiencies close to 100%, but the overall efficiency of conventional devices is limited to about 20% mainly by the photon extraction. One approach to overcome this issue is the implementation of an additional scattering layer into the device. A standard OLED is used to study the impact of such layer. This layer can either be created by a direct surface structuring or the introduction of an additional transparent layer. ZnO is a suitable choice for the latter due to its transmittivity in the entire visible spectrum, caused by its direct optical bandgap of 3.3eV. This layer is deposited on a glass substrate. The micro- and nano-structure of ZnO can be adjusted by combining a structure-giving diblock copolymer with sol-gel chemistry. It is investigated how different structuring, which is analyzed by scattering techniques and electron microscopy, can influence the external quantum efficiency and the macroscopic properties of the OLEDs over the entire spectral range.
For the emissive layer mainly the well-studied Super Yellow (PDY-132) system is used, but, being a singlet emitter, one can not expect to reach top efficiencies.

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