Abstract

Organic light emitting diodes (OLEDs) became part of our daily life, due to their employment in smartphones and television displays. Low energy consumption and potentially cheap manufacturing costs are only two of the main key features making OLEDs interesting for applications in commercially available products. In order to produce OLEDs with low energy consumption, the use of an efficient emitter is crucial. Moreover, the generated light from the emitter inside the OLED has to be extracted from in order to improve the external quantum efficiency. Considering this, first attempts of designing and synthesizing new emitting materials that can form supramolecular nanofibers via π-stacking are made. These materials are then investigated regarding, if those materials can improve the external quantum efficiency by orienting the transition dipole moments of the emitters in a specific direction, since the most substantial radiation emitted by a molecule is oriented perpendicular to the transition dipole moment.

The first part of this work will focus on the synthesis of a π-stacking ligand, which will then be investigated for its π-stacking properties. This ligand will then be employed in a copper (I) complex, which is based on a bidentate phosphine ligand and a bidentate phenathroline ligand forming a heteroleptic complex. These types of copper complexes usually show thermally activated delayed fluorescence (TADF), and therefore they possess a high quantum yield. The main focus here is the detailed investigation of the π-stacking copper complex and its impact on the photoluminescence as well as its quenching behavior.

In the second part of this work, a new system with a pure organic TADF emitter was synthesized. This pure TADF emitter is based on an asymmetric donor-acceptor-donor system, exhibiting two different donor groups, which is then characterized concerning its optical and electrochemical properties. With this emitter, low temperature PL measurements are particularl< interesting because the prompt fluores-

cence and the delayed fluorescence differ in energy, which cannot be observed at room temperature. This part will focus on this characterization as well as its application in a solution processed multilayer OLED. Finally, the asymmetric purely organic TADF emitter is attached to a π-stacking molecule and a first test of the π-stacking and quenching behavior way performed.