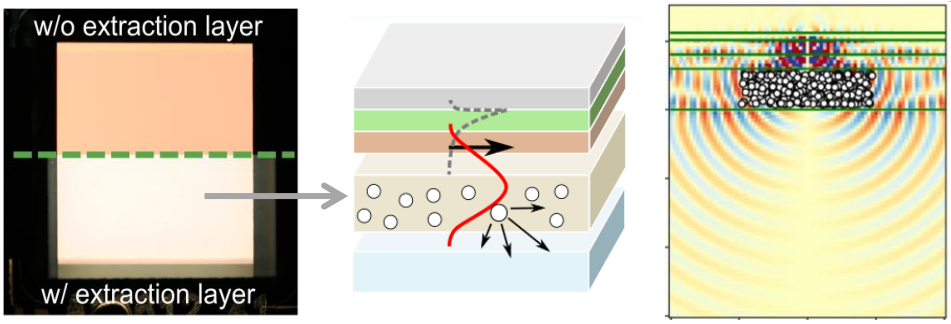
Lichttechnisches Institut
Engesserstrasse 13
Geb. 30.34
76131 Karlsruhe
www.lti.kit.edu

Master's thesis

Simulation of core-shell nanoparticles for light extraction in organic LEDs



Motivation and Objective

State of the art organic light emitting diodes (OLEDs) exhibit very high internal quantum efficiencies, while still suffering from strong optical loss mechanisms. An improved light extraction can be realized by adding an internal volumetric scattering layer, containing nanoparticles. Hereby, the propagation of wave-guided modes can be disturbed.

Even though, a rapid increase in hardware performance has been achieved in recent years, the modeling of light scattering by large disordered systems of nanoparticles remains challenging and of particular interest for real-world applications. At the Light Technology Institute, an original Python software package has been developed to handle such disordered systems in planar layer stacks.

This master thesis aims to analyze the potential of core-shell nanoparticles for light extraction from OLEDs. Core-shell interactions add an additional degree of freedom to scattering particles. Hereby, completely different scattering characteristics, like zero back-scattering, can be obtained.

The candidate will develop and integrate simulation routines for core-shell particles into our simulation framework. Following on the optimization of particle geometry and material composition, extensive OLED simulations will be performed to evaluate the particles performance.

Further utilization of core-shell particles for different applications like optical broadband filters can be investigated.

Prerequisites

We are looking for a candidate with a strong affinity for numericall work and computational engineering.

Programming experience in Python and/or Matlab is beneficial and a basic knowledge of wave optics is desired.

Research areas
Nano-photonics,
Wave optics,
Software development

Places
LTI (KIT, Campus South)

Focus
Photonics,
Computational engineering

Study path
Physics,
Electrical engineering
or related disciplines

Starting period
as of now

Contacts
Dominik Theobald
Guillaume Gomard

Email
Dominik.theobald@kit.edu
Guillaume.gomard@kit.edu