Project: (version of April 7, 2008)

Numerical Simulation of Organic LED

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Funding: Institute of Computational Physics (ICP)
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Duration: ongoing

White Organic Light-Emitting Diodes (OLEDs) are highly efficient light sources that can potentially be used for general lighting. They can also be printed on flexible surfaces resulting in light-emitting flexible foils. In the past three years a very fast increase in luminous efficacy has been shown which is very promising as at present 10-15% of the global energy production is used for lighting.
Moreover, OLEDs have entered the small- and medium-size flat panel display market.
The increasing complexity of OLEDs (layer composition and structures) demands an experimentally validated comprehensive OLED device model to design efficient and rational OLEDs.
The task of this project is the development of an efficient 1-dimensional model that integrates the entire chain of physical processes taking place in OLED operation. The main challenge is to incorporate novel physical models in the course of the project, which lead to strongly coupled partial differential equations, into an efficient solver. Only efficient solvers can support the device optimization and characterization efforts in the community.
The highly non-linear form of the mobility as a function of the local carrier concentration and field in disordered materials requires novel stable and CPU-efficient algorithms for solving the coupled electronic-excitonic 1D models for steady-state and transient (a.c.) current-voltage-luminance calculations.