Fundamentals of organic electronics
WS 2011/12

Prof. Dr. Uli Lemmer

1 Date and place

Lectures: Every Friday starting 14.10.2011, 11:15-12:45, INF 227/SR 2.401.
Exercises: Every other Wednesday starting 26.10.2011, 14:15-15:45, INF 227/SR 2.403.

2 Contact

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3 Objective

- Understanding of the theoretical basics on organic electronics.
- Specific knowledge of the most important organic electronic devices: organic light emitting diodes, organic field-effect transistors, organic solar cells and photodetectors, organic lasers, integrated optical systems and organic memory cells.

4 Prerequisites

Bachelor's degree in Physics (or equivalent).

5 Literature

- Hand-outs and reading material will be distributed in advance to the students.
- Organic molecular solids, M. Schwoerer and H.Ch. Wolf, Willey-VCH 2007.
- Physics of organic semiconductors, Ed. W. Brütting, Willey-VCH 2005.

6 Contents

- **Introduction**
- **Review of the basic electronic properties of organic semiconductors**
- **Organic light emitting diodes (OLEDs)**
  - Introduction
  - Photometric quantities
  - OLED breakthroughs: Anode improvements – Cathode improvements – Heterostructures – Phosphorescence – Doped transport layers
  - OLED performance
  - Advanced concepts: Multiphoton-OLEDs – White OLEDs – Dendrimers – Quantum Dot OLEDs – Light management
- **Applications in lighting and displays**
  - Degradation
  - Towards mechanically flexible devices
  - Current production schemes: Cluster tools – In-line production – Printing and coating technologies
  - Passive and active matrix displays
  - OLED-lighting
- **Organic field-effect transistors**
  - Introduction
  - Thin film transistors
  - The role of carrier mobilities
  - Applications: RFID and related circuits – Electronic paper – OFET-based sensing
- **Organic solar cells and photodetectors**
  - Organic photovoltaics: Introduction – Exciton dissociation at internal interfaces – Optimization
  - Organic photodetectors
- **Lasers and integrated optical systems**
  - Organic laser basics
  - Organic semiconductor lasers
  - Distributed feedback lasers
  - Lab-on-chip-systems: Waveguide coupled lasers
- **Further devices**
  - Organic memory cells
  - Organic thermoelectric generators