“Luminescence of mesogenic semiconductors”

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Organic **l**ight **e**mitting **d**iodes (OLEDS) are expected to have several advantages compared to well known inorganic LEDs, e.g. larger emitting areas, lower power consumption, and a variety of colors, accessible via small changes in the chemical structure.

In particular, liquid crystalline (mesogenic) compounds are discussed to be used in OLEDs due to two main reasons: discotic molecules exhibit high charge carrier mobility whereas calamitic molecules are used for systems which emit linear polarized light.

In this work, discotic derivatives of triphenylene, pyrene, and perylene were examined. The energy levels were determined by means of absorption spectroscopy and cyclic voltammetry. Photoluminescence characteristics were detected. The fluorescence quantum efficiencies go along with the brightness of the electroluminescence. Because of aggregation (excimers) the entire visible spectra is accessible. To evaluate the electroluminescence the voltage-current density dependence and the voltage-brightness dependence were measured. Single-layer OLEDs reach a brightness of 100 Cd/m^2 (like a notebook panel). Multilayer OLEDs with several hole and electron conduction layers give access to 400 Cd/m^2.

A sophisticated task was to align the discotic compounds in a planar orientation. Therefore, a device was constructed which allowed to cover glass substrates with poly-(tetrafluoroethylene). For the first time, it was possible to produce electroluminescent samples which emit linear polarized light by using discotic liquid crystals. However, the succeeded degree of polarization D of D = 2 was only small but promising for further studies.