“Polarised Luminescence of Mesogenic Semiconductors“

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In this work, a homologous series of di-2,5-[(ethylhexyl)-oxy] substituated oligo(*p*-phenylene-vinylenes) with *p*-(decyloxyl)-phenyl endgroups was tested for its suitability as emitting material in light-emitting diodes which are able to emit linearly polarised light. The liquid crystalline character of the OPV-derivatives was utilised for the fabrication of highly orientated organic layers. Different polymers were tested as orientation layers. The best results were obtained with PTFE layers. In this way, a dichroic ratio for photoluminescence of $D_{PL} = 16{,}3$ could be obtained for the OPV pentamer. For the other oligomers, a decreasing photoluminescence dichroism was found for a decreasing number of oligomeric units: The measured dichroic ratios were $D_{PL} = 12{,}1$ for the tetramer, $D_{PL} = 10{,}9$ for the trimer and $D_{PL} = 3{,}5$ for the dimer.

Using PTFE orientation layers, polarised OLEDs containing the different OPV derivatives as emitting material and Alq_3 as electron-conducting material could be fabricated. The best results were obtained for the pentamer OLED: At an applied voltage of 20 V a luminance of approximately 400 Cd/m^2 and an efficiency of $2{,}7 \cdot 10^{-2}$ Cd/W were measured. An electroluminescence dichroism of $D_{EL} = 8{,}7$ for the pentamer OLED, $D_{EL} = 8{,}5$ for the tetramer, $D_{EL} = 4{,}2$ for the trimer and $D_{EL} = 1{,}9$ for the dimer could be achieved. The threshold voltages of the series of OPVs were found to be increasing with decreasing chain length.

The second part of this work documents the modification of the high-vacuum evaporation apparatus and the construction of a sample holder for the OLED fabrication.