Charge Transport in Polymer Light-Emitting Diodes

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Abstract

Since the discovery of electroluminescence in conjugated polymers it has been recognised that charge transport is a key ingredient for the performance of polymer light-emitting diodes (PLEDs). It is demonstrated that at low voltages the quantum efficiency of a PLED is limited by the unbalanced electron and hole transport in the polymer. The response time of a PLED, which is relevant for its use in pixilated displays, is governed by the transit time of holes towards the cathode. The hole transport in various derivatives of poly(-p-phenylene vinylene) (PPV) is characterised by a combination of space-charge effects and a field- and temperature dependent mobility. The specific form of the mobility provides information on the relation between chemical composition of the polymer and microscopic charge transport. From this relation the power efficiency of PPV-based LEDs has been optimised.

Biography

Paul W.M. Blom was born in Maastricht, The Netherlands, in 1965. He received his Ir. Degree (Physics) in 1988 and his Ph. D. Degree in 1992, respectively, from the Technical University Eindhoven, Eindhoven, The Netherlands. His thesis work was on picosecond charge carrier dynamics in GaAs quantum wells. At Philips Research Laboratories he was engaged in the electrical characterization of various oxidic thin-film devices, the electro-optical properties of polymer light-emitting diodes, and rewritable optical storage based on phase-change and magneto-optical recording. In 2000 he was appointed as Professor at the University of Groningen, where he is currently engaged in the physics of (bio)organic molecular materials.