

New developments in polymer light emitting diodes – on flexible substrates and with triplet emitters

Armin Wedel, Silvia Janietz, Dessislava Sainova, Hartmut Krueger

Fraunhofer Institute for Applied Polymer Research
Geiselbergstrasse 69, D-14476 Golm, Germany

The application of the organic light emitting diodes (OLEDs) as backlights and indicators elevates them as important topic in the rapidly developing field of flat panel display technologies. Flexible screens may redefine the way things are displayed in the future. These screens enable portable and instant displays anytime and anywhere. Unfortunately, there are some obstacles in the development of flexible screens that these screens cannot yet be found in the retail stores. The obstacles are mainly of technical and chemical nature.

A significant factor for the successful OLED-application is the high operational stability of the devices. In particular the choice of the material used as emitting layer and layers used as buffer layer is essential since it directly influences the stability of OLEDs. The current-voltage and brightness-voltage characteristics have been measured and stability tests under negative bias stress have been performed.

In addition, the overall matrix performance has been investigated varying the substrate layout (separation of the single pixels) and the emissive layer (green, red or blue). Special attention has been associated to the single pixel stability under application of a negative bias stress and resultant gradual activation of not-directly addressed pixels. The materials must be structurally pure and entirely free of impurities and must show a high rectification ratio.

The entire OLED preparation starting from the careful substrate cleaning until the encapsulation was done using clean room and glove box facilities. Optimisation procedures have been applied on different steps of the device preparation e.g. the deposition conditions of the different layers constituting the devices and the configuration of the electrodes. The lifetime tests on the encapsulated devices have been performed in ambient atmosphere under constant current driving mode of the experimental set up.

We are able to prepare passive-matrix displays and OLEDs for background lighting and symbol displays emitting in all three main colours with our own materials and with materials from different suppliers. First displays were also manufactured on the base of flexible high barrier substrates.