Optical amplification in polymer based materials and devices

Results in Brief

Design improvements for optoelectronics devices

Advances in polymer-based optoelectronics materials offer solutions to today's increasing demand for light-emitting diode (LED) products with greater light output, efficiency and reliability than ever before.

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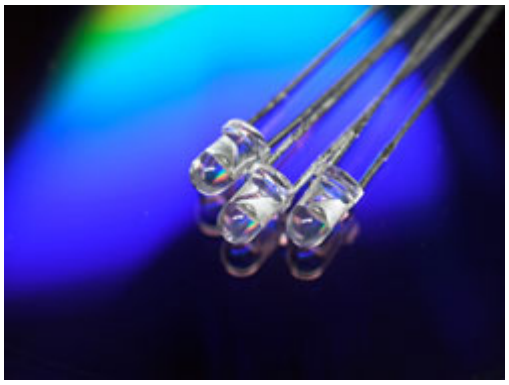

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Polymer light-emitting diodes (PLEDs) have been introduced as promising candidates for the next generation displays, particularly for portable electronic devices. A number of inherent qualities, including full-spectrum colour displays and high brightness at low drive voltages, render PLEDs ideally suited for mobile phones, digital cameras and MP3 players.

However, one of the major concerns for their large-scale commercial exploitation remains their power efficiencies, since these are directly dependent on battery usage. High quality devices are continuously emerging through the use of new polymer-based optoelectronics materials; and therefore an explicit description of the contact (metal/polymer) region has become necessary.

To accurately evaluate the current-voltage characteristics of organic material-based LEDs, a theoretical approach has been adopted within the OPAMD project for the

analysis of the contact phenomena. Researchers at the Technion-Israel Institute of Technology considered the contact region as an intrinsic part of the device and provided numerical simulations of the charge distribution for the entire device.

On the basis on their results, LEDS that can operate at a voltage as low as 3V and demonstrate fast switching times of a few nanoseconds were designed and manufactured. Technion researchers moving one step further explored the possibility of using a new generation of polymers exhibiting high mobility.

At extremely high modulation frequencies of at least 500MHz, doped polymer LEDs manufactured at Technion offered high photoluminescence efficiency combined with a long operating lifetime. In the next phase of research, demonstrators of visible polymer LEDs will be benchmarked for future commercial exploitation.

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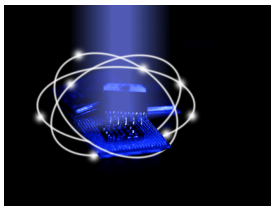

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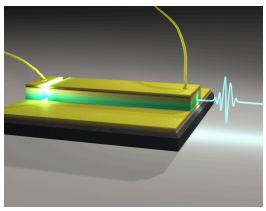

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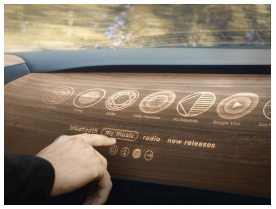

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Project Information

OPAMD

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