

# Next Generation Light Source

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The Technische Universität Dresden partakes in one of the world's largest projects on the development of innovative organic light-emitting diodes (OLEDs). Scientists at the Institute of Applied Photophysics have been developing highly efficient white organic light-emitting diodes which could perhaps serve as the light sources of the future.

More than 20 of Europe's leading companies and research institutes have joined together in a research project entitled OLLA in order to advance organic light-emitting diode technologies for lighting applications. The research team comprises European universities and research institutes as well as leading industrial players like Osram, Philips and Siemens and aims at the further development of light-emitting diodes toward a light source with a long lifetime and a high energy efficiency. "Our goal is a lifetime of 10.000 hours – which is 10 times longer than a standard light-bulb – and an efficiency of 50 lumens per Watt," says Peter Visser of Philips, project manager of OLLA.

The next generation light source will be both flat – only half a millimetre thin – and light. It will have an extremely long lifetime, using only little energy in spite of its high brightness. Also, it will allow for various shape and colour combinations and a variety of appearances. Until now, OLEDs have primarily been developed for display applications with regard to mobile phones, laptops and televisions; however, they are supposed to serve as light sources in the future, too. Showing excellent characteristics, organic light-emitting diodes could compete with light bulbs and neon tubes in 10 or 15 years time. "In my opinion OLEDs are the ideal office room lighting. They can be attached flat to the ceiling

and spread the light diffusely in the entire room,” Professor Karl Leo of the Institute of Applied Photophysics at the TU Dresden explains the benefits of the organic light source.

There is a myriad of possible applications for the innovative lighting technique. With the help of transparent light-emitting diodes windows could for instance be turned into light sources at night.

Scientists have adopted the OLED principle from nature. The basic principle of luminescence can for instance be observed with fireflies. Analysing this phenomenon, researchers noticed that some organic materials are comparable with semiconductors and, thus, are suitable for the transport of electric charges.

Organic light-emitting diodes consist of semiconducting organic layers which are in total only 100 nanometers wide and lie between two electrodes, an anode and a cathode, respectively. If voltage is applied to the electrodes, a current flows through the organic layers and – by the mechanism of electroluminescence – electrical energy is directly converted into light. By applying chemically diverse layers the desired colours can be generated. Currently, the Institute of Applied Photophysics is exploring methods to produce white light-emitting OLEDs based on small organic dye molecules. All processes are vacuum-based to allow for convenient solution-free processing which in turn allows for high reproducibility and yield.

The OLLA project, which is running until the year of 2008, comprises a budget of nearly 20 million Euros.

Source: Technische Universitaet Dresden

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