

Red light-emitting diode sets new efficiency record

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Osram Opto Semiconductors has raised the efficiency of its high-performance red light-emitting diode (LED) by 30% under laboratory conditions. This record-setting efficiency was achieved through optimization of the chips.

The improved LED is currently more efficient than any other diode that operates at the same wavelength. Red LEDs are used in vehicle taillights and brake lights, for example, and for illuminating buildings and stages. They are also used to generate one of the base colors in small projectors, and in combination with white LEDs, they produce a very comfortable warm white light for illuminating interiors. The efficiency increase means the units now achieve a higher light output at the same level of [power consumption](#). However, their application not only saves energy but also space, since fewer [diodes](#) can now produce the same brightness.

LED efficiency ratings indicate the amount of light that can be obtained from one watt of electric output. The rating is determined by how much light can be generated in a chip and what portion of light is actually emitted at the surface. In order to achieve a high level of output efficiency, the chip's internal and surface structures must be designed in such a manner as to ensure that as little light as possible is reflected and absorbed in the chip. In developing the new chip, Osram engineers improved the material properties and output efficiency of their high-performance thin-film chips.

The result is a prototype of a red Golden Dragon Plus LED that emits at

a wavelength of 615 nanometers (nm) and delivers 119 lumens of light per watt at a current of 350 milliamperes. Its [high efficiency](#) of 44% also reduces waste heat by nearly 50% as compared to previous LED versions. This, in turn, reduces the need for cooling, and also means that the designs can be made smaller. Because casting resin in the housing also affects [light](#) output, unencapsulated chips benefit even more from the improvements.

Plans call for the new technology to be transferred from the lab into production as quickly as possible. Osram developers also expect to achieve further significant efficiency increases, as the potential for material improvement and the optimization of output efficiency has yet to be exhausted. In addition, the company plans to apply the new technology to yellow (590 nm) and hyper red (645 nm) LEDs.

Provided by Siemens

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