

LEDs on silicon can reduce production costs

21 May 2012



A new manufacturing technology is expected to greatly reduce the cost of light-emitting diodes (LEDs) in the future. For the first time ever, researchers at the Siemens subsidiary Osram Opto Semiconductors were able to successfully produce gallium nitride LED chips on a silicon substrate instead of the much more expensive sapphire backing.

A new manufacturing technology is expected to greatly reduce the cost of light-emitting diodes (LEDs) in the future. For the first time ever, researchers at the Siemens subsidiary Osram Opto Semiconductors were able to successfully produce gallium nitride LED chips on a silicon substrate instead of the much more expensive sapphire backing. Silicon is a standard material in the semiconductor industry and is therefore an inexpensive and easily obtainable alternative. This development goes a long way toward making it possible for Osram to produce LED components at a much lower cost while maintaining the same level of quality and performance.

LEDs are an efficient and, above all, energy-conserving alternative to traditional types of room lighting. However, until now the manufacturing costs for LEDs have been higher than those of other more established types of lighting, so they have not been widely adopted for everyday use.

Using this new procedure, it should be possible to use large sheets of silicon for LED production, which would result in a major improvement of manufacturing efficiency. Osram has already succeeded in producing high-performance LED chips on a 150-millimeter (six-inch) wafer. Theoretically, one such wafer would be sufficient to produce 17,000 LED chips of one square millimeter each. Researchers are already working on the adjustment of the production process to handle eight-inch wafers. This would increase the number of chips per substrate, thereby further reducing the cost of production. The first commercially available LED products using silicon-based chips are expected to be on the market in about two years.

These new thin-film-based LEDs are still only at the pilot stage and will have to be tested under real-world conditions. The blue and white silicon-based prototypes display performance characteristics that are on a par with the [LEDs](#) available on the market today. A blue [chip](#) measuring one square millimeter in a standard housing delivers a record brightness of 634 milliwatts at 3.15 volts. That's an efficiency rate of 58 percent. Those are excellent results for a chip of that size at a current of 350 milliamperes.

The development of these new manufacturing technologies is based on the specialized knowledge regarding the growth of artificial crystals that has been gathered by the researchers at Osram Opto Semiconductors. The major breakthrough was a special epitaxy process which made it possible to slice off particularly stable silicon films without the cracking that has often been a problem in the past. At the same time, these silicon films are also comparable to sapphire backing with regard to the LEDs' brightness and stability.

Source: Siemens

APA citation: LEDs on silicon can reduce production costs (2012, May 21) retrieved 19 April 2021 from <https://phys.org/news/2012-05-silicon-production.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.