LEDs on silicon can reduce production costs

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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