

## Solid State Lighting

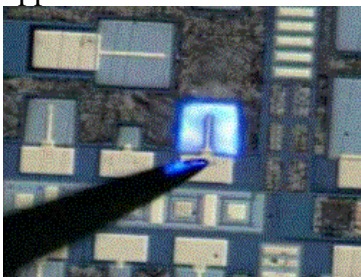
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Today, 21% of energy use is in lighting, and, perhaps, half or more of this energy can be saved by switching to efficient and cold solid-state lighting sources. Solid-state lighting will use visible and UV LEDs that are projected to reach lifetimes exceeding 100,000 hours. From traffic lights to road signs, from automobile taillights to outdoor displays, from landscape to accent lights, solid-state light sources have already arrived as harbingers of the next lighting revolution.

The creation of efficient sources of white light is the ultimate goal of the solid-state lighting technology.<sup>1</sup> The efficiency of white LEDs using conversion of blue or UV light in ionic phosphors (now approximately up to 20 lm/W, already twice of that for incandescent lamps) is expected to reach 50 lm/W by year 2010. Polychromatic all-semiconductor lamps based on state-of-the-art red-to-yellow AlGaInP LEDs and blue-green AlInGaN LEDs with the quantum efficiencies in excess of 50% and 20%, respectively, can exhibit luminous efficiencies exceeding 100 lm/W and compete with any conventional white lamp.

Optimization of such multi color LED modules is one of the most important problems of the emerging solid-state lighting technology. Solving this problem has allowed us to design and build Versatile Solid State Lamps with adjustable spectrum for treating seasonal affective disorder.<sup>2</sup> Such solid state lamps that maintain constant user-selected spectrum via computer control will also find many other special and medical applications.



Blue LED on Si (courtesy  
of SET, Inc.)



Edison bulb (1879)



Versatile solid state lamp

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<sup>1</sup> A. Žukauskas, M. S. Shur, and R. Gaska, Introduction to Solid State Lighting, John Wiley and Sons, 2002, ISBN: 0471215740

<sup>2</sup> A. Zukauskas, R. Vaicekauskas, G. Kurilcik, Z. Bliznikas, K. Breive, J. Krupic, A. Rupsys, A. Novickovas, P. Vitta, A. Navickas, V. Raskauskas, M. S. Shur, and R. Gaska, Quadrichromatic white solid-state lamp with digital feedback, SPIE 5187-24