



Light Up My Life

This particular issue of *Interface* is all about lighting and features the ECS Luminescence and Display Materials (LDM) Division. The title of this column is inspired by the award-winning ballad of the '70s written by Joe Brooks. The song, *You Light Up My Life*, as many of you may recall, was most notably recorded by Debby Boone (Pat Boone's daughter) and became a chart-topper. Solid-state lighting is a hot topic as well, especially given the current concerns with energy efficiency and the inefficiency of incandescent light bulbs. Long-standing ECS member, Nick Holonyak, Jr. (*Ed. Note*: See the spring 2009 issue of this magazine), reported the first practical demonstration of a solid-state lighting source based on an inorganic semiconductor in 1962. The resultant device, a light-emitting diode or LED, was intensely studied in the 1970s in terms of the underlying solid-state physics principles, and by the end of the decade, LEDs had displaced incandescent bulbs in automobile indicator lamps and tail lights. Small plasma discharge vacuum tubes were also becoming less popular for use in numeric displays. The mid- to late-1980s heralded the development of light-emitting devices based on organic semiconductors or OLEDs. The performance of these OLED devices has seen quantum improvements in the decades since, thanks in part to the demands imposed by use in flat-panel displays. The 1990s also saw two major breakthroughs in inorganic LED technology: AlInGaP-based high-brightness red and amber sources developed by groups in Hewlett Packard and Toshiba and corresponding green and blue LEDs developed by Shuji Nakamura and co-workers at Nichia. These technologies are discussed in the feature articles in the pages that follow.

The title of my column could well have read *Clean Up My Planet*. Solid-state lighting has little of the environmental consequences associated with conventional lighting in that ca. 20% of electricity generated is used for lighting and fossil-derived electricity generates smog, particulates, and SO_x/CO₂ emissions. Thus any savings in electricity use translates to concomitant energy and environmental savings; for example, by the year 2020, electricity used for lighting may be cut by 50%, sparing the atmosphere 28 million metric tons of carbon emission annually according to U.S. Department of Energy estimates. As an intermediate tech transition, compact fluorescent lamps (CFLs) are already putting a major dent in the sales of conventional incandescent light bulbs. Indeed, Edison's light bulb may well turn out to be as quaint as the phonograph record. General purpose lighting requires white LEDs (WLEDs) and that is where much of the "quiet revolution" is occurring today in overcoming the technology and cost barriers.

From a humanitarian point of view, lighting technology plays a key role in rural areas with no grid electrification. Bringing light into the homes of millions of people in remote corners of the world has been a life mission of Dave Irvine-Halliday and the Light Up The World Foundation (www.lutw.org). In rural communities in Sub-Saharan Africa and in Asia, lighting is dominated by smoky kerosene lamps that contribute to chronic respiratory and sight disorders, in addition to missed learning, business, and other opportunities. LUTW has installed 20,000 lighting systems in 42 countries (including India, Pakistan, Nepal, Sri Lanka, South Africa, and Afghanistan) and has done much to raise awareness about the cycle of illiteracy and poverty connected with the lack of affordable lighting. Their "Eureka!" moment came with the realization that WLEDs could revolutionize lighting and the quality of life at the bottom of the pyramid comprised of populations living in impoverished conditions, especially in the developing world.

Clearly, lighting (and display) technology represents an incredible opportunity for members of the LDM Division and the Society at large in terms of "lighting up this world" and making a tangible and meaningful difference in many lives around the globe. In this regard, the three feature articles that follow and the Chalkboard column that re-appears in this particular issue present a snapshot of some of the key technical issues. Stay tuned.

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