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The invention of high efficient blue LEDs and future lighting

In 1970's and 80's, an efficient blue and green light-emitting diodes (LED) were the last missing elements for solid-state display and lighting technologies due to the lack of suitable materials. By that time, III-nitride alloys was regarded the least possible candidate due to various "impossible" difficulties. However, a series of unexpected breakthroughs in 1990's totally changed people's view angle. Finally, the first high efficient blue LEDs were invented and commercialized simultaneously in 1993. Nowadays, III-nitride-based LEDs have become the most widely used light source in many applications. The LED light bulbs are more than ten times efficient than incandescent bulb, and they last for 50 years. At their current adoption rates, by 2020, LEDs can reduce the world's need for electricity by the equivalent of nearly 60 nuclear power plants. The history of the invention of blue LED and future lighting will be described.

Biography

Shuji Nakamura has obtained his BE, MS, and PhD degrees in Electrical Engineering from the University of Tokushima, Japan in 1977, 1979, and 1994, respectively. He joined Nichia Chemical Industries Ltd in 1979. In 1988, he spent a year at the University of Florida as a visiting research associate. He is the 2014 Nobel Laureate in Physics for the invention of efficient blue light-emitting diodes, which has enabled bright and energy-saving white light sources. He received the 2014 Order of Culture Award in Japan. Since 2000, he has been a Professor of Materials and Electrical & Computer Engineering at the University of California, Santa Barbara. He holds more than 200 US patents and over 300 Japanese patents. He has published over 550 papers in his field. He is the Research Director of the Solid State Lighting & Energy Electronics Center and The Cree Chair in Solid State Lighting & Displays. He co-founded Soraa, Inc. in 2008, which operates vertically integrated fabrication facilities in California's Silicon Valley and Santa Barbara.

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