

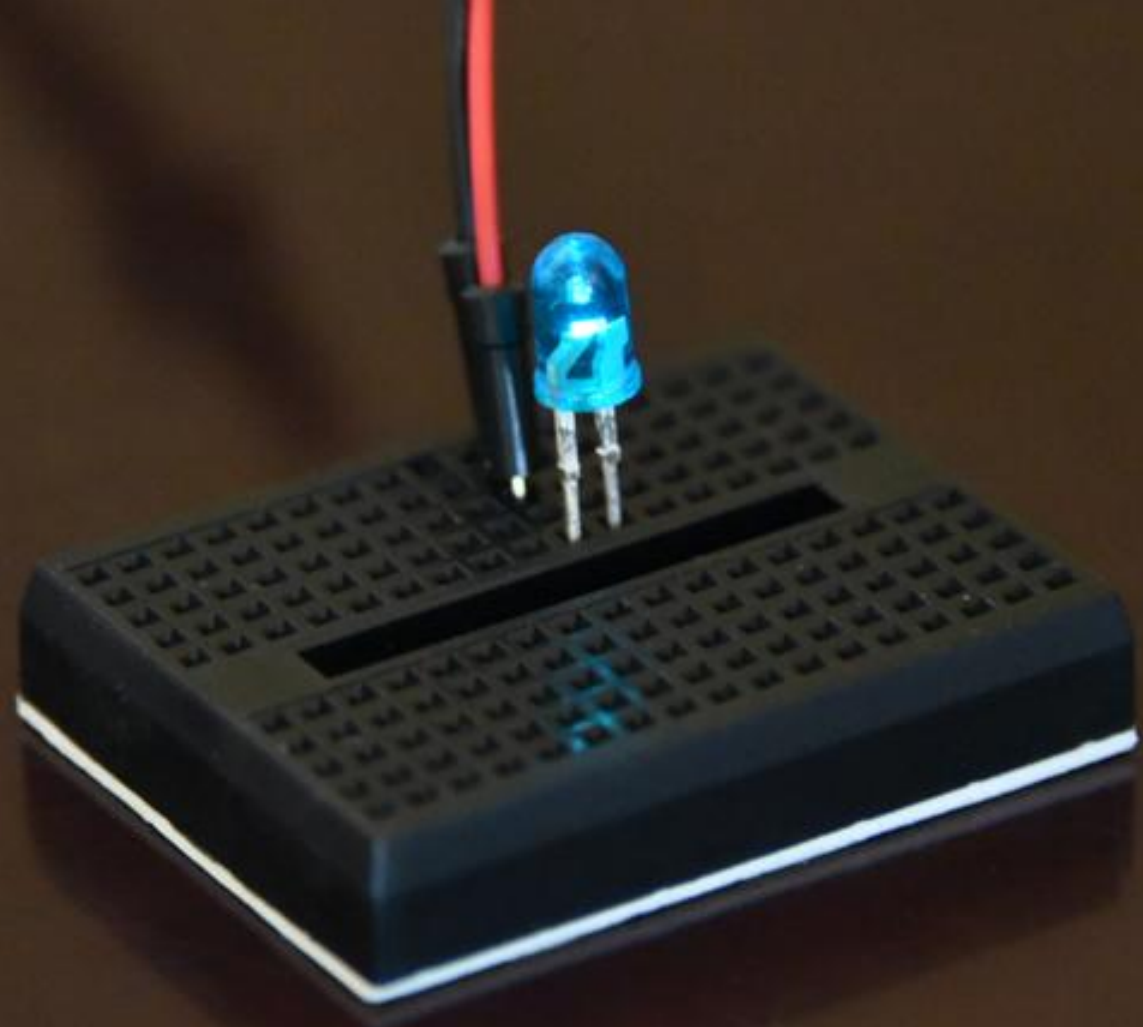
Design Ethics

Flora, Minnie and Manuja

Technology Artefact - Blue LED

Created by Shuji Nakamura.

His breakthrough in creating blue LEDs was a significant advancement in lighting technology and was instrumental in the development of energy-efficient white LED lighting.



History

Early Years of LED Technology (1960s-1970s): LEDs were first developed in the early 1960s. Initially, only red LEDs were available, followed by the development of green LEDs in the late 1960s. However, blue LEDs remained elusive due to the lack of suitable semiconductor materials.

Research Challenges (1980s): In the 1980s, scientists faced significant challenges in creating blue LEDs. The main hurdle was finding a semiconductor material that could emit blue light efficiently. Various attempts were made using different materials, but none were successful in producing high-brightness blue light.

Shuji Nakamura's Breakthrough (1990s): The breakthrough came in the early 1990s when Shuji Nakamura, a Japanese engineer working at Nichia Corporation, successfully developed the first high-brightness blue LED using gallium nitride (GaN) semiconductor materials. Nakamura's innovation was a game-changer, as it enabled the production of blue LEDs with sufficient brightness for practical applications.

Nobel Prize Recognition (2014): Nakamura's groundbreaking work on blue LEDs, along with the contributions of Isamu Akasaki and Hiroshi Amano, earned them the Nobel Prize in Physics in 2014. Their research laid the foundation for the development of energy-efficient white LED lighting and blue laser diodes.

Advancements in LED Technology: Following Nakamura's breakthrough, rapid advancements were made in LED technology. Researchers focused on improving the efficiency, brightness, and color quality of LEDs. This led to the development of a wide range of LED products for various applications, including lighting, displays, automotive lighting, and more.

White LED Lighting Revolution: One of the most significant impacts of blue LEDs was their role in the development of white LED lighting. By combining blue LEDs with phosphor coatings or using RGB LED arrays, it became possible to create white light with high efficiency and color quality. White LED lighting has since become a popular alternative to traditional incandescent and fluorescent lighting due to its energy efficiency and long lifespan.

Further Innovations: Since Nakamura's breakthrough, researchers and engineers continue to innovate in LED technology. Advances include improvements in efficiency, color rendering, spectral tuning, and miniaturization. Additionally, blue LEDs have enabled new applications such as UV (ultraviolet) LED technology for sterilization, water purification, and medical treatments.

Purpose

The discovery of the blue LED has enabled the creation of bright and energy-saving white light sources, which have various applications in different fields. For example, in the medical field, blue light is used for treating infections and other antibacterial applications, as well as for pain relief, inflammation, and stiffness.

Additionally, the blue LED's significance extends beyond lighting, enabling advancements in technology such as Blu-ray discs, optical storage, and UV LED applications for sterilization and medical treatments.



Reviews / Critiques

“Chief among the health consequences of blue light is its ability to suppress the production of melatonin, the hormone that regulates sleep patterns in humans and other organisms. Numerous scientific studies have **warned that increased exposure to artificial blue light can worsen people’s sleeping habits**, which in turn can lead to a variety of chronic health conditions over time.”

“David Smith, of the conservation charity Buglife, said: “**Light pollution can dramatically impact invertebrates**, whether that be how they go about their daily lives, or even by reducing populations of species that live in habitats lit by LED lights. Given that invertebrates are already suffering dramatic declines, it is vital that we relieve them from all pressures to provide the best chance of recovery.””

<https://www.theguardian.com/environment/2022/sep/14/increase-in-led-lighting-risks-harming-human-and-animal-health>