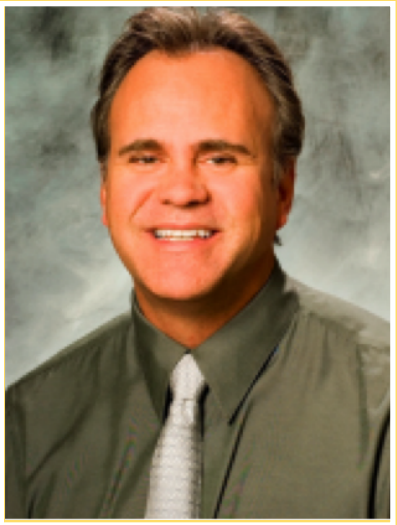
Distinguished Lecture Series

EECS COLLOQUIUM

Fall 2015



Wednesday
September 16
4:00 - 5:00pm

Refreshments
served at 3:30pm

Hewlett-Packard Auditorium
306 Soda Hall

Future Directions in High efficiency Solid State Lighting: Next Generation LEDs and Laser Lighting

Steve DenBaars
Professor of Materials and Co-Director of the Solid-State Lighting and Energy Center, UC Santa Barbara

Abstract

Novel semiconductor materials (based on InGaN) have been used to fabricate blue LEDs and Laser diodes (LDs) which has lead to the realization of many applications such as LED TV displays, Laser based automotive headlights, and now affords high-efficiency white solid-state lighting. The materials breakthroughs which lead to solid state lighting received recognition by the awarding of the 2014 Nobel Prize in Physics to Professors Akasaki, Amano, and Nakamura. Solid State Lighting based primarily on blue GaN LEDs is estimated to replace over 50% of installed lighting by 2030, and save the USA over 50 gigawatt power plants in electricity consumption. Next generation LEDs using novel structures (GaN layers substrates) grown by specific deposition methods (metal-organic chemical vapor deposition, MOCVD) have shown remarkable external quantum efficiencies greater than 80%. These novel violet LEDs have been combined with three types of phosphors to produce light of exceptional spectral range and quality (Color Rendering Index CRI=95). Even brighter white light sources have been achieved using a novel combination of semiconductor laser diodes and Garnet crystals (YAG:Ce). Laser diode based white light structures now exhibit luminous efficacy greater than 83 lm/Watt. We believe that solid-state laser lighting has the potential to achieve 85% energy efficiency, corresponding to white light luminous efficacy of 255 lm/Watt, which would lead to revolutionary new compact white lighting sources. This work supported in part by the Solid State Lighting and Energy Electronics Center (SSLEEC).

Biography

Dr. Steven P. DenBaars is an Professor of Materials and Co-Director of the Solid-State Lighting and Energy Center at the University of California Santa Barbara.Specific research interests include growth of wide-bandgap semiconductors (GaN based), and their application to Blue LEDs and lasers and high power electronic devices. This research has lead to the first US university demonstration of a Blue GaN laser diode.

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