Photonic Structures for Efficient Light Extraction and Conversion in Multi-Color LEDs

Tech ID: 21913 / UC Case 2005-534-0

BRIEF DESCRIPTION

Multiple-light source LEDs that provide increased light extraction and conversion efficiencies, as well as increased brightness, while retaining planar structures.

BACKGROUND

The green-yellow portion of the visible spectrum is still lacking efficiency, while the combination of different colors on a single substrate is very limited with state-of-the-art semiconductors grown by conventional methods. Alternative materials should be used, and phosphors can offer good solutions. There is a need in the art for improving the far-field patterns of the different components of emission that make the color rendering angle-dependent without significantly increasing the size of the device.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed multiple-light source LEDs that provide increased light extraction and conversion efficiencies, as well as increased brightness, while retaining planar structures. The LEDs contain several emitting species, each providing light emission in a range of wavelengths. Photonic crystals, acting as diffraction gratings, ensure efficient light extraction, efficient excitation of the optically-pumped species, and provide a means for modifying the far-field emission pattern for optimal shape.

ADVANTAGES

- Increased brightness
- Increased light extraction and conversion efficiencies

APPLICATIONS

- Multi-color LEDs

This technology is available for a non-exclusive license. See below for a selection of the patents and patent applications related to this invention. Please inquire for full patent portfolio status.

PATENT STATUS

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<tr>
<th>Country</th>
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<td>United States Of America</td>
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<td>7,768,023</td>
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ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- High Efficiency LED with Optimized Photonic Crystal Extractor
- Volumetric Hole Injection with Intentional V-Defects
- Wavelength-Selective Phosphor Coating for Laser Lighting Devices
- Method for Growing Self-Assembled Quantum Dot Lattices
- Method for Manufacturing Improved III-Nitride LEDs and Laser Diodes: Monolithic Integration of Optically Pumped and Electrically Injected III-Nitride LEDs
3D Hole Injectors for InAlGaN Light-Emitting Diodes
Infrared Detector Utilized in Ultrahigh Resolution Imaging
Enhanced Hole Injection by P-Type Active Region and Lateral Injection in InAlGaN LEDs
Improved Manufacturing of Solid State Lasers via Patterning of Photonic Crystals
Single or Multi-Color High Efficiency LED by Growth Over a Patterned Substrate
Improved Manufacturing of Semiconductor Lasers