

# Junctionless Semiconductor Light Emitting Diodes and Lasers

Tech ID: 21761 / UC Case 2011-350-0

## BACKGROUND

Lighting is a major contributor to electricity consumption, accounting for 19 percent of global use and 34 percent in the U.S. The U.S. lighting market is currently dominated by the incandescent light bulb and is only 5percent efficient whereas the fluorescent lamp is 15 to 25 percent efficient. Compact fluorescent lamps (CFLs) have a rated lifespan of 6,000 to 15,000 hours whereas incandescent bulbs have a lifespan of only 750 to 1,000 hours. On the other hand, CFLs contain small amounts of mercury, a neurotoxin, which gets released with breakage. Solid-state luminaires, which are typically based on light-emitting diodes (LEDs), have the potential to revolutionize the industry with higher efficiency, lower maintenance, and better quality/safety, possibly leading to a reduction by half of energy consumed by general illumination.

## TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed novel semiconductor light-emitting diode devices that do not require forming a physical p/n junction and are not constrained by p- or n- doping in certain semiconductors. The semiconductor material can be in the form of thin films or nanostructures (e.g., nanowires). The lighting device can operate in AC or DC mode and allows color tuning with phosphors or dual/triple color light-emitting modules. Relative to conventional LEDs, the invention presents the advantages of reduced processing complexity, reduced cost, and greater design adaptability.

## INTELLECTUAL PROPERTY INFO

The invention is in the proof-of-concept stage. It has a provisional patent application and is available for sponsored research and/or licensing.

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,793,685	10/17/2017	2011-350

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## OTHER INFORMATION

### KEYWORDS

solid state lighting, LED, incandescent  
bulb replacement, compound  
semiconductors,  
cathodoluminescence  
electroluminescence, nanowires,  
phosphors

### CATEGORIZED AS

- **Materials & Chemicals**
  - Nanomaterials
- **Nanotechnology**
  - Electronics
  - Materials
- **Semiconductors**
  - Materials

### RELATED CASES

2011-350-0