

## UC Santa Barbara Researchers Set New Records in Energy Efficient Light Emitting Diodes

Santa Barbara, Calif. -- December 13, 2006 -- Researchers at UC Santa Barbara's Solid State Lighting & Display Center and the Japan Science & Technology Agency's Exploratory Research for Advanced Technology program (JST ERATO) have set new records for nonpolar and semipolar light emitting diode (LED) efficiency. This new class of gallium nitride-based LEDs is based on new nonpolar and semipolar orientations of GaN with record external quantum efficiencies, and they exhibit polarized light emission.

The new non-polar LEDs have an external quantum efficiency of 41% and radiant powers as high as 25 mW for standard sizes (300  $\mu\text{m}$  x 300  $\mu\text{m}$ ) and operating current (20 mA). The semipolar LEDs exhibited external quantum efficiency of 30% and radiant powers as high as 18 mW, also for standard chip sizes and operating current (20 mA). The polarized light emission will enable a new class of light sources and will be useful in applications such as LCD backlighting.

The groups, led by Shuji Nakamura, Steve DenBaars and James Speck -- all professors of materials -- have also achieved c-plane LEDs with external quantum efficiencies of 66%. These LEDs have been used to make white LED lamps which boast a luminous efficacy of 116 lm/W -- more efficient than both incandescent bulbs and fluorescent lamps. The commercial applications of nonpolar LEDs include LCD backlighting, projection televisions, medical imaging and general illumination.

Research funding was jointly provided by the member companies of the Solid State Lighting & Display Center and JST ERATO.

### Engineering at UC Santa Barbara

Engineering at UC Santa Barbara is considered a leader in bioengineering, chemical and computational engineering, materials science, nanotechnology, optics and physics. UCSB has five faculty Nobel Laureates and one winner of the Millennium Technology Prize. The College of Engineering's uniquely successful interdisciplinary and entrepreneurial approach to research and learning is central to these achievements. UCSB's Solid State Lighting & Display Center, [www.sslcdc.ucsb.edu](http://www.sslcdc.ucsb.edu), is focused on advancing new semiconductor-based energy efficient lighting and display technologies through partnerships with key industry leaders.

Released by Barbara Bronson Gray

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