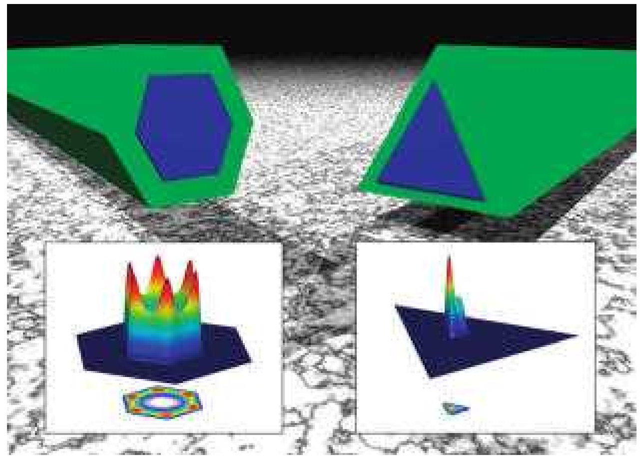
June 22, 2011

Nanoscale Effects on Heterojunction Electron Gases in GaN/AlGaN Core/Shell Nanowires



In a paper titled "Nanoscale Effects on Heterojunction Electron Gases in GaN/AlGaN Core/Shell Nanowires" published in Nano Letters, Sandia scientist Bryan M. Wong, and EFRC scientists François Léonard, Qiming Li, and George T. Wang, present a theoretical and computational study of the electronic properties of core/shell nanowires. They find that the nanometer size scales combined with the highly anisotropic cross-sections of these nanowires strongly influences the behavior of the electron distribution, leading to confinement at corners and polar faces, and transitions between core-centered and interface-confined electron gases. More generally, their results indicate that electron gases in closed nanoscale systems are qualitatively different from their bulk counterparts.

Bulk semiconductor-semiconductor heterojunctions have been instrumental in enabling technological breakthroughs in electronics and optoelectronics, including for solid-state lighting. Such heterojunctions in core/shell nanowires have recently been proposed as a novel route for solid-state lighting technology. In order to assess the potential of such systems, it is important to understand the fundamental electronic and optical properties of these core/shell nanowires.

June 27-28, 2011

Jeff Tsao participates in "Energy Efficiency and the Rebound Effect" Workshop

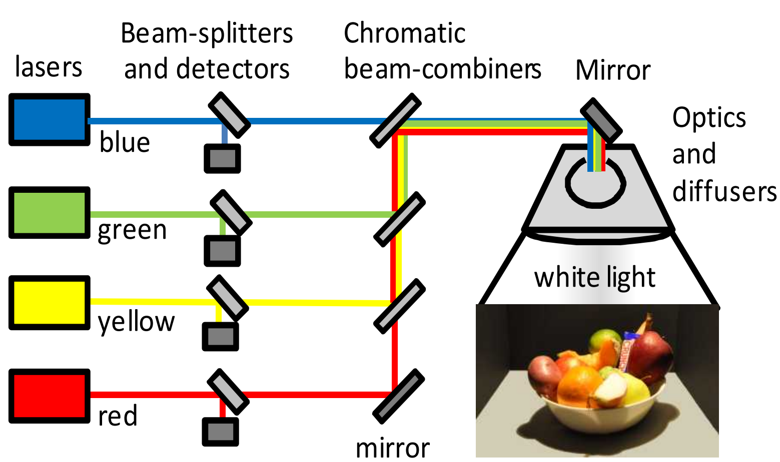
The rebound (or take-back) effect) is the term in energy economics used to describe the effectin which increases in energy efficiency do not necessarily lead to simple 1:1 decreases in energy consumption, but instead are "taken back" in the form of higher consumption of the goods and services that the energy is used to create. Although taken very seriously in Europe, both in academia and in policy circles, the rebound effect has not been taken very seriously in the U.S. There are pockets of activity, but no serious government programs aimed at understanding it.

Nonetheless, there is a small community in the U.S. is working in this area, particularly passionate around its importance to U.S. and world policy aimed at mitigating global climate change. As a result of their efforts, the first U.S. workshop on this effect just took place: the "Energy Efficiency and the Rebound Effect" workshop, held at the AAAS Building, Washington DC June 27-28 2011, and organized by Ines Azevedo (Co-Director) and Granger Morgan (Director) of Carnegie Mellon University's NSF-supported Center for Climate and Energy Decision Making. The workshop was relatively small, about 35 participants from universities (both U.S. and international) and national laboratories (LBNL, NREL, ORNL, Sandia) and about 5 observers (AAAS, DOE-EERE, EPA). The participants all gave short presentations (including a presentation by Jeff Tsao on historical trends in the consumption of light) followed by vigorous discussion.

July 4, 2011

Four-color laser white illuminant demonstrating high color-rendering quality

Solid-state lighting is currently based on light-emitting diodes (LEDs) and phosphors. Solid-state lighting based on lasers would offer significant advantages including high potential efficiencies at high current densities. Light emitted from lasers, however, has a much narrower spectral linewidth than light emitted from LEDs or phosphors. Therefore it is a common belief that white light produced by a set of lasers of different colors would not be of high enough quality for general illumination.June 22



In a paper just published in a special "Optics in LEDs for Lighting" issue of Energy Express (a supplement to Optics Express), Sasha Neumann (graduate student at the University of New Mexico), Jon Wierer (EFRC scientist), Wendy Davis (scientist at NIST Gaithersburg), Yoshi Ohno (scientist at NIST Gaithersburg), Steve Brueck (Professor at the University of New Mexico and EFRC external partner), and Jeff Tsao (EFRC scientist), tested this belief experimentally. They found the opposite to be true: in terms of color rendering quality, white light from a four-color (RYGB) laser setup is virtually indistinguishable from white reference light, including that from an incandescent lamp and three phosphor-converted LEDs (warm white, neutral white and cool white). This result paves the way for the use of lasers in solid-state lighting.