

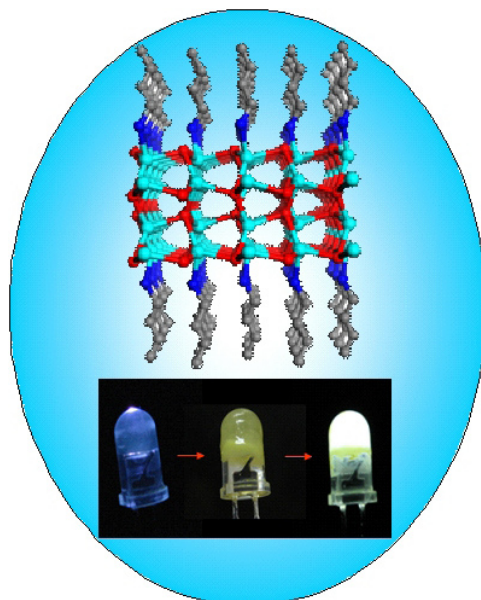
Contact: Yair Harel

Office of Technology Commercialization
Rutgers, The State University of New Jersey
3 Rutgers Plaza, ASB III, 3rd Floor
New Brunswick, NJ 08901
Cook Campus: 732.932.0115 x3006
email: harel@ocltt.rutgers.edu

Rutgers Inventor:

Jing Li, Ph.D.
Department of Materials Science and Engineering

Rutgers Technology #: 08-038



A New Type of Semiconductor Material for Energy-Efficient White-Light LEDs

Invention Summary: Rutgers researchers have developed a new type of semiconductor material that is capable of generating white light directly from a single material so that there is no need for using complex mixing/doping processes. Light emitting diodes (LEDs) are energy-saving lighting devices that are fast growing in recent years. LEDs utilize semiconductor materials to convert electricity to light more effectively than conventional lighting sources. These devices are capable of generating about twice as much light per watt as incandescent light bulbs with a lifetime about 50 times longer. White-light LEDs have great potential for general lighting applications and are typically produced by combining red, green and blue (RGB) LEDs. Phosphor conversion is another technique used to produce white LEDs, in which white light is generated by coating a blue or near-UV LED with a yellow or multichromatic phosphor. However, such processes are often associated with complex doping schemes, and significant reduction of device efficiency due to problems such as self-absorption, relatively low light capture efficiency of phosphores or nonradiative carrier losses.

Market Applications: Lighting.

Advantages: Since the new semiconductors are capable of generating direct white light from a single material, complex doping/combination processes used at the present time to make LEDs can be avoided. Consequently they will be less expensive. In addition, the optical properties of these materials can be tuned systematically to enhance lighting power and efficiency, making them possible to be used in general lighting applications.

Intellectual Property & Development

Status: A provisional patent application has been filed.

Recent Publications :

- Li, J.; Bi, W.-H.; Ki, W.; Huang, X.-Y.; Reddy, S. "Nano-structured Crystals: Unique Hybrid Semiconductors Exhibiting Nearly Zero and Tunable Uniaxial Thermal Expansion Behavior", *J. Am. Chem. Soc.*, 2007, 129, 14140.
- Lee, J. Y.; Olson, D. H.; Pan, L.; Emge, T. J.; Li, J. "[M(bdc)(ted)0.5]•2DMF•0.2H₂O (M = Zn, Cu): Microporous Metal Organic Frameworks with High Gas Sorption and Separation Capacity", *Adv. Func. Mater.*, 2007, 17, 1255-1262.