

Posted: July 7, 2008

Nanotechnology research to enhance future digital imaging

(*Nanowerk News*) Led by Sri Sridhar, Distinguished Professor and Chair of Physics at Northeastern University, a team of researchers from the university's Electronic Materials Research Institute has published research that has resulted in a new breakthrough in the field of nanophotonics, the study of light at the nanoscale level. Utilizing nanomanufacturing processes, the researchers were able to develop an optical microlens with a step-like surface, instead of a smooth surface, that has the capacity to operate at infrared frequencies using the novel phenomenon of negative index refraction.

The team of researchers involved with this project includes Wentao Lu, Ph.D., Bernard Didier F. Casse, Ph.D., and Yongjiang Huang, all from Northeastern. Their findings were published in a recent edition of the journal, *Applied Physics Letters*.

By using nanolithography, a manufacturing technique used for electronic circuits, the team was able to fabricate this planoconcave lens in the nanoscale. These microlenses function in the infrared frequency range, which is used for optical communications, and use the novel phenomenon of negative refraction, which is not found to occur in natural materials, but can be created in artificial metamaterials. Microlenses are a critical component of optoelectronic devices, which utilize the flow of light rather than of conventional currents as is used in conventional electronics. The technology of these optical circuits has the capacity to create superior devices for data capturing and storage, and for producing high quality, high pixel count images.

“These nano-optical components are essential for superior optical transmission and reception of data that will be used in the future generation of imaging and communication devices,” explained Sridhar. “Our ultimate goal is to integrate both optical and electronic devices onto a single chip, creating a single platform that utilizes both light and electrons with the potential to significantly increase the quality of circuits that are at the heart of all digital electronic devices today.”

About Northeastern

Founded in 1898, Northeastern University is a private research university located in the heart of Boston. Northeastern is a leader in interdisciplinary research, urban engagement, and the integration of classroom learning with real-world experience. The university's distinctive cooperative education program, where students alternate semesters of full-time study with semesters of paid work in fields relevant to their professional interests and major, is one of the largest and most innovative in the world. The University offers a comprehensive range of undergraduate and graduate programs leading to degrees through the doctorate in six undergraduate colleges, eight graduate schools, and two part-time divisions. For more information, please visit <http://www.northeastern.edu>.

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