ERC Team Receives "R&D 100" Award for Nanoscale Imaging Microscope

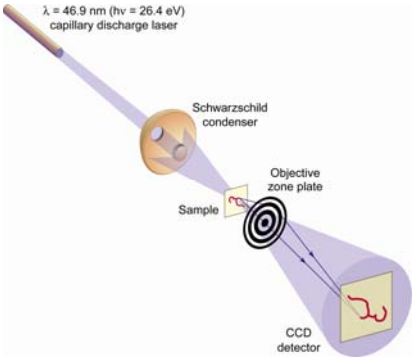
A team of researchers and students from NSF's Engineering Research Center (ERC) for Extreme Ultraviolet (EUV) Science and Technology, based at Colorado State University, made use of short-wavelength extreme ultraviolet laser light to develop a tabletop microscope capable of imaging objects with nanoscale dimensions. The EUV ERC's Professor Carmen Menoni led the team that developed the microscope, which combines a compact EUV laser developed at Colorado State with specialized lenses created at Lawrence Berkeley National Laboratory and mirrors created at the Lebedev Physics Institute in Moscow and the National Technical University in Kharkov, Ukraine. Using a single laser shot of about one nanosecond duration, this breakthrough EUV microscope can take images of structures with a spatial resolution of 0.054 micrometers (µm), while the majority of conventional broad-area optical microscopes have a spatial resolution of approximately 0.2 µm. These new compact EUV full-field microscopes are expected to have a wide range of applications in nanoscience and nanotechnology, and their use opens the possibility of being able to track the dynamics of nanoscale objects.

R&D Magazine selected this compact microscope as one of the Top 100 most significant technological advances for 2008, recognizing the team of researchers that includes six graduate students with the "Oscar of Invention," an R&D 100 Award.

Peters, R., ed. Extreme UV Lasers Bring the Nanoscale to the Benchtop, *R&D Magazine*. Sept. 2008, Advantage Business Media, Rockaway, NJ. (available online at http://www.rdmag.com/ShowPR~PUBCODE~014~ACCT~1400000101~ISSUE~0809~RELTYPE~A813~PRODCODE~00000000~PRODLETT~KJ.html)

Patents or other steps toward commercialization:

Contributing Agency: NSF



Researchers from the NSF Engineering Research Center for Extreme Ultraviolet Science and Technology receiving an R&D 100 Award in Chicago for the invention of a compact EUV microscope.

Intellectual Merit (why notable or important):

This development of a "tabletop" EUV microscope capable of imaging objects with nanoscale dimensions is vital for advancing all the many areas of science and technology that depend on measurements that conventional visible light microscopes cannot resolve.

Broader Impacts (why notable or important):

Because they fit on a tabletop, these new compact EUV full field microscopes are potentially available to a wider spectrum of institutions and researchers. Because the discovery was made at an Engineering Research Center, the results of this pioneering research are fully integrated into both undergraduate and graduate education. Indeed, graduate students participated in the research and shared in the R&D 100 Award. Publication in *R&D Magazine* and elsewhere ensures the dissemination of these results.

Does this highlight represent transformative or potentially transformative research?

Yes.

This groundbreaking work moves the potential forward for new discoveries in nanotechnology and nanoscience. *R&D Magazine* selected this compact microscope as one of the Top 100 most significant technological advances for 2008.

Does this highlight represent Broadening Participation?

Yes

Every Engineering Research Center involves the participation of several institutions across the U.S., as well as a diverse faculty and student body. This project included a woman as the PI and a female student among the graduate student participants.

Are there existing or potential societal benefits of this research?

These new compact EUV full field microscopes are expected to have a wide range of applications in nanoscience and nanotechnology, resulting in economic benefits and benefits in medicine and many other fields