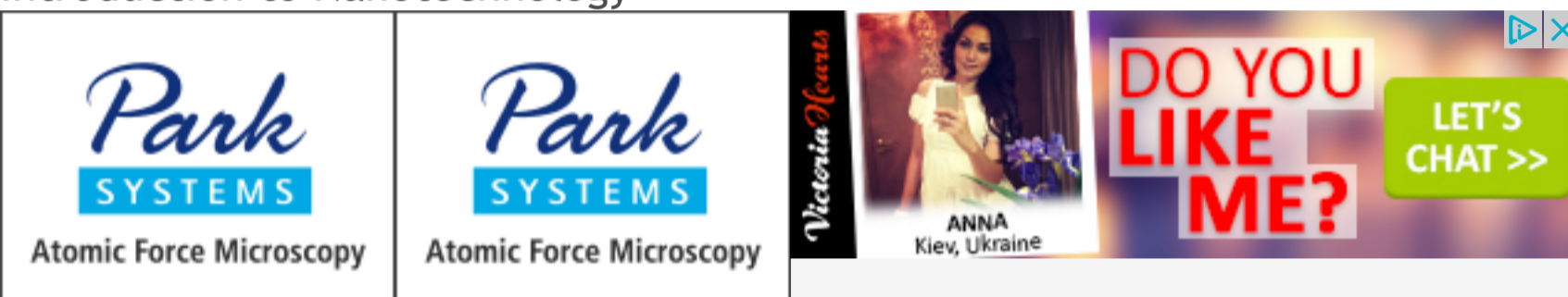


[Home](#)[News](#)[Nano Databases](#)[Nano Catalog](#)[Nano Jobs](#)[Resources](#)[Introduction to Nanotechnology](#)

Park SYSTEMS Atomic Force Microscopy

Park SYSTEMS Atomic Force Microscopy

Victoria Hearts

ANNA
Kiev, Ukraine

DO YOU LIKE ME? LET'S CHAT >>

Nanotechnology General News

The latest news from academia, regulators research labs and other things of interest



nano werk **Subscribe to our daily newsletter Free!**

Posted: Jan 22, 2018

Optical nanoscope allows imaging of quantum dots

(*Nanowerk News*) Physicists have developed a technique based on optical microscopy that can be used to create images of atoms on the nanoscale. In particular, the new method allows the imaging of quantum dots in a semiconductor chip. Together with colleagues from the University of Bochum, scientists from the University of Basel's Department of Physics and the Swiss Nanoscience Institute reported the findings in the journal *Nature Photonics* ("[Far-field nanoscopy on a semiconductor quantum dot via a rapid-adiabatic-passage-based switch](#)").

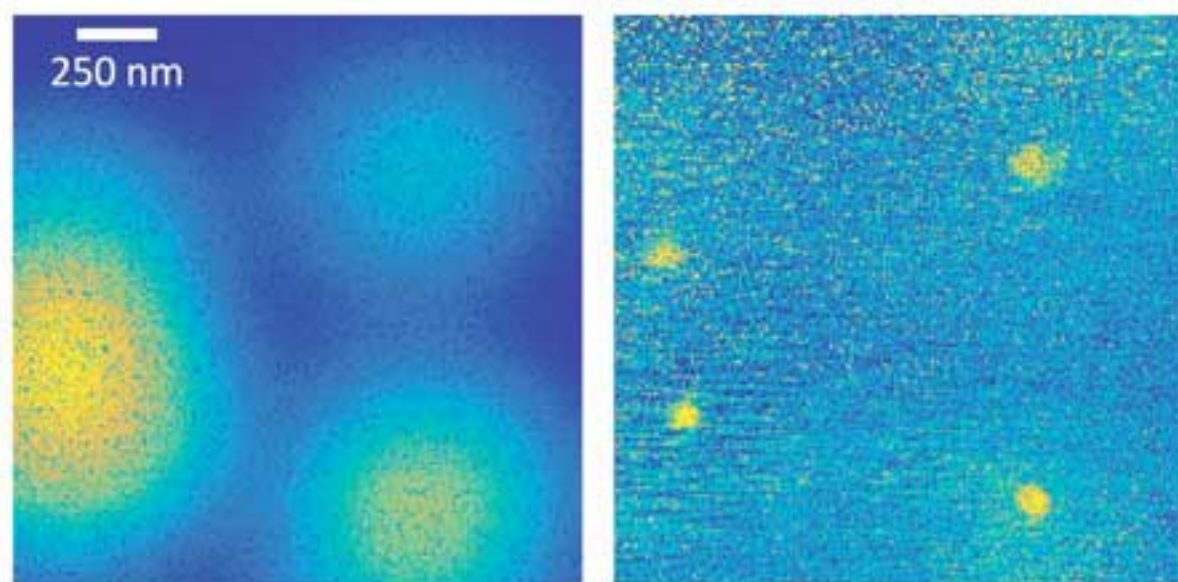


Image of quantum dots in a semiconductor: whereas the image taken with a normal microscope is blurry (left), the new method (right) clearly shows four quantum dots (bright yellow spots). (Image: University of Basel)

Microscopes allow us to see structures that are otherwise invisible to the human eye. However, conventional optical microscopes cannot be used to image individual molecules and atoms, which measure just fractions of a nanometer across. This has to do with the wave nature of light and the associated laws of physics, which were formulated by the German physicist Ernst Abbe back in 1873.

According to these laws, a microscope's maximum resolution is equal to half the wavelength of the light used. For example, if you use green light with a wavelength of 500 nanometers, an optical microscope can, at best, distinguish objects at a distance of 250 nanometers.

Switched on and off

In recent years, however, scientists have managed to get around this resolution limit and generate images of structures measuring just a few nanometers across. To do so, they used lasers of various wavelengths to trigger fluorescence in molecules in part of the substance while suppressing it in the surrounding areas. This allows them to image structures such as dye molecules, which are just a few nanometers in size. The development of this method (Stimulated Emission Depletion, STED) was honored with the Nobel Prize in Chemistry 2014.

For all objects with two energy levels

Timo Kaldewey, from Professor Richard Warburton's team at the University of Basel's Department of Physics and Swiss Nanoscience Institute, has now worked with colleagues at Ruhr-University Bochum (Germany) to develop a similar technique that allows the imaging of nanoscale objects, particularly a quantum mechanical two-level system.

The physicists studied what are known as quantum dots, artificial atoms in a semiconductor, which the new method was able to image as bright spots. The scientists excited the atoms with a pulsed laser, which changes its color during each pulse. As a result, the atom's fluorescence is switched on and off.

Whereas the STED method only works by occupying at least four different energy levels in response to the laser excitation, the new method from Basel also works with atoms that have just two energy states. Two-state systems of this kind constitute important model systems for quantum mechanics.

Unlike STED microscopy, the new method also releases no heat. "This is a huge advantage, as any heat released can destroy the molecules you're examining," explains Richard Warburton. "Our nanoscope is suitable for all objects with two energy levels, such as real atoms, cold molecules, quantum dots, or color centers."

Source: *Universität Basel*



Subscribe to a free copy of one of our daily **Nanowerk Newsletter Email Digests** with a compilation of all of the day's news.

Precision Nanomaterials Printer



These articles might interest you as well:

sonopl^{ot}



Powered by Google
Powered by Google

Nanowerk
21K likes

Like Page

Research News

(click here for Business News)

The world's smallest electro-optic modulator could lead to big energy savings

Posted: Jan 22, 2018

Proton transport in graphene shows promise for renewable energyA new approach to rechargeable batteries

Posted: Jan 22, 2018

Posted: Jan 22, 2018

Engineers design artificial synapse for brain-on-a-chip hardware

Posted: Jan 22, 2018

Researchers make thermochromic windows with perovskite solar cellOptical nanoscope allows imaging of quantum dots

Posted: Jan 22, 2018

Posted: Jan 22, 2018

Magnetic semiconductor layers of a new typeMultifunctional nanomedicine platform for the delivery of gene therapeutics

Posted: Jan 22, 2018

Posted: Jan 22, 2018

Making fuel cells for a fraction of the costCharge order and electron localization in a molecule-based solid

Posted: Jan 22, 2018

Posted: Jan 22, 2018

New metal-semiconductor interface for brain-inspired computingNew semiconductor processing technology with nanosponges

Posted: Jan 22, 2018

Posted: Jan 22, 2018

New fuel cell technology runs on solid carbonTaking control at the junctionTwo dimensional circuit with magnetic quasi-particles



Posted: Jan 22, 2018

Posted: Jan 22, 2018

Posted: Jan 22, 2018

Palladium nanoparticles can repair atomic dislocations in their crystal structure Taking a a deep look at memristors

Posted: Jan 22, 2018

Posted: Jan 19, 2018

A stopwatch for nanofluids A nanophenomenon that triggers the bone-repair process

Posted: Jan 19, 2018

Posted: Jan 19, 2018

2-D tin without buckling: A possible topological insulator Tuning perovskite solar cells with nanoparticle additives

Posted: Jan 19, 2018

Posted: Jan 19, 2018

Electrical fields drive nano-machines a 100,000 times faster than previous methods Crystal clear

Posted: Jan 19, 2018

Posted: Jan 18, 2018

New method uses DNA, gold nanoparticles and top-down lithography to fabricate optically active structures

Posted: Jan 18, 2018

Coupling experiments to theory to build a better battery

[...MORE NANOTECHNOLOGY RESEARCH NEWS](#)

Posted: Jan 18, 2018



Find
Fac

Nanotechnology Home | Privacy

| Site

Never miss an article!

Subscribe to one of our newsletters for the topic of your choice and get all new posts by email once a day. No spam ever. Promise!

[Sign me up!](#)

The contents of this site are copyright ©2018 Nanowerk. All rights reserved.



Never miss an article!

Subscribe to one of our newsletters for the topic of your choice and get all new posts by email once a day. No spam ever. Promise!

[Sign me up!](#)