ANALYTICAL CHEMISTRY

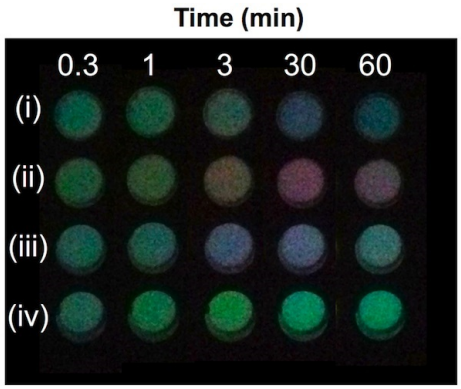
Capturing The Glow Of Quantum Dots With A Smartphone

Bioimaging: The camera on a smartphone can pick up signals from quantum-dot tags used to detect biological molecules

by ***Neil Savage***
MARCH 7, 2014

Quantum dots—bits of semiconductor materials a few nanometers in diameter—are useful as optical tags for biological assays. They luminesce in different colors depending on their size and composition, have long shelf lives, and don't fade from repeated exposure to light like other tags. But because labs have needed expensive equipment to detect individual wavelengths of light, they often stick with older tagging methods. Now, researchers have shown that today's sharper smartphone cameras do just as well as specialized fluorescence instruments for **analyzing quantum dots** (*Anal. Chem.* 2014, DOI: **10.1021/ac500131r**). The results could lead to cheaper, more sensitive tests that could be performed in doctors' offices or other places with limited access to laboratory equipment.

SHINE ON



Credit: W. Russ Algar

A smartphone camera captures an image of a quantum-dot-based assay for three proteases. The color emitted by the quantum dots evolves over time (left to right) for a reference sample with no protease (i) and samples with different concentrations of the proteases (ii-iv).

Eleonora Petryayeva and **W. Russ Algar**, chemists at the **University of British Columbia**, put together an assay to detect three different proteases using a technique called fluorescence resonance energy transfer (FRET). They used dots with a cadmium-selenide-sulfide core surrounded by a zinc-sulfide shell that emitted red, green, or blue light. They then attached the dots to peptides that interact with the three proteases, using a different color for each. Finally, they attached dye molecules to the peptides that quenched the fluorescence of the quantum dots, reducing their light emission.

To test the assay, they shone a handheld ultraviolet light on a solution containing the quantum dots mixed with the proteases. As proteases cut the peptides, the dye molecules moved away from their associated quantum dots, allowing the dots to brighten. An iPhone captured images of the solution at 20-second intervals, with filters to block the UV light, which allowed the chemists to watch the proteases at work.

MOST POPULAR IN ANALYTICAL CHEMISTRY

Thirty years of DNA forensics: How DI has revolutionized criminal investigations

Thirty years of DNA forensics: How DI has revolutionized criminal investigations

Tracing the chemistry of household d

Los test de antígenos para la COVID-1 ya están disponibles en los Estados Unidos, pero no todo el mundo se apresura para tenerlos

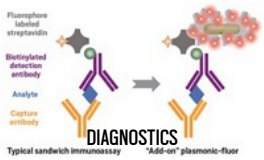
Polymer-coated electrode detects PF in water

Fingerprints are more than just patterns; they're chemical identities

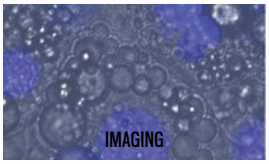
The study is just a proof of concept, Algar says, and the next step is to optimize the system for an existing diagnostic test. Researchers have yet to develop many of the tests that could benefit from this approach, he says. But because smartphones have sufficiently sensitive cameras—plus the ability to store, process, and transmit data—they offer a way to make tests based on luminescent labeling much more portable and affordable.

Chemical & Engineering News
ISSN 0009-2347

YOU MIGHT ALSO LIKE...



Ultrabright fluorescent label improves assay speed and sensitivity



Single-atom switcheroo yields fluorescent dyes activated by visible light

ANALYTICAL CHEMISTRY

Nanoparticles For Imaging Six Ways To Sunday

Buy a next generation ICP-MS and get an ICP-OES for FREE
by PerkinElmer

COMMENTS

biman basu
(March 10, 2014 12:02 AM)
great!!!
Reply »

LEAVE A COMMENT

Name

Email*

Comments by first-time contributors will be reviewed prior to appearing on the site. This review is done by humans and not always immediately. You may be laudatory or critical, but please stay on topic and be respectful of the author and your fellow readers. We reserve the right to remove any comments that are profane, obscene, abusive, or otherwise inappropriate. Email addresses are required so that we can verify you are not a robot overlord and in case we need to contact you about your comment privately. They will not appear on the site.

Submit

*Required to comment

MOST POPULAR IN ANALYTICAL CHEMISTRY

Thirty years of DNA forensics: How DI has revolutionized criminal investigations

Thirty years of DNA forensics: How DI has revolutionized criminal investigations

Tracing the chemistry of household d

Los test de antígenos para la COVID-1 ya están disponibles en los Estados Unidos, pero no todo el mundo se apresura para tenerlos

Polymer-coated electrode detects PF in water

Fingerprints are more than just patterns; they're chemical identities