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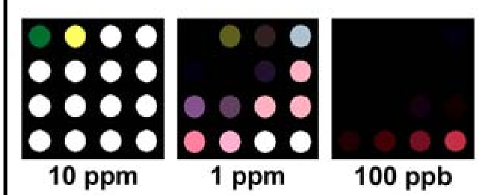
A simple sensor that can detect airport shoe bombs

By Andrew Nusca | Nov 2, 2010 | **0** Comments



As any American who's ever flown on an airplane abroad can attest, it's a little silly that only the United States requires passengers to remove their footwear as they pass through security.

To date, no one has successfully detonated such a device (though some have tried). Yet no matter the footwear — yes, even flip flops — they must come off.

At the core of such concern is a device containing the compound **triacetone triperoxide**, a high-powered explosive that's easy to make and difficult to detect, because it evades most chemical sensing indicators: it doesn't fluoresce, absorb ultraviolet light or readily ionize.

Because of this, detecting TATP requires large, expensive equipment that's not ready for primetime in an airport. Moreover, existing machines can only detect relatively high concentrations of TATP in solid or liquid (not gas) form, and require a significant sample size.

As a result, we remove our shoes for TSA officials to review under X-ray.

Now, **University of Illinois** chemists have developed a simple sensor to detect the explosive.

Professor **Kenneth Suslick** and researcher **Hengwei Lin** developed a colorimetric sensor array that can quantitatively detect very low levels of TATP vapor, down to 2 parts per billion.

(Suslick's name sound familiar? We previously wrote about him last September, when he developed an "electronic tongue" that digitally measures sweetness.)

To create the array, the scientists printed a series of 16 tiny colored dots, each a different pigment, on an inert plastic film. A solid acid catalyst is used to break down TATP into components, which cause the pigments to change color.

It's not unlike litmus paper. The resulting colors depend on the concentration of TATP detected in the air, and are digitally imaged before and after exposure using a flatbed scanner or electronic camera.

"The pattern of the color change is a unique molecular fingerprint for TATP at any given concentration and we can identify it in a matter of seconds," Suslick said in a statement.

Unlike other chemical sensors, the array is unaffected by changes in humidity or exposure to other chemicals, such as shampoo or laundry detergents. It also has a long shelf life, the researchers said.

The researchers also developed a prototype handheld device, now being commercialized by Palo Alto, Calif.-based **iSense**. (You can see it in the picture at right.)

Next stop: improved luggage and passenger screening at airports and other sensitive facilities. And perhaps a smart solution to removing your shoes before every flight.

The researchers' findings were published in the *Journal of the American Chemical Society*.

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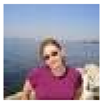

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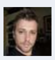

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Larry Dignan is Editor in Chief of ZDNet and SmartPlanet as well as Editorial Director of ZDNet's sister site TechRepublic. He was most recently Executive Editor of News and Blogs at ZDNet. Prior to that he was executive news editor at eWeek and news editor at Baseline. He also served as the East Coast news editor and finance editor at CNET News.com.

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Larry Dignan has nothing to disclose. He doesn't hold investments in the technology companies he covers.

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