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NOSE KNOWS NOXIOUS GASES

Dyes on a new sensor react to correctly identify toxic chemicals, scientists find.

By Rachel Ehrenberg

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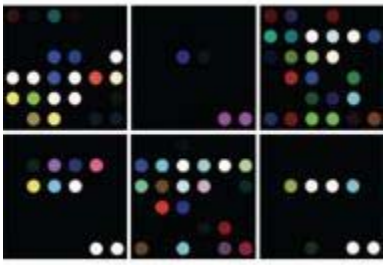

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Nose for danger

Toxic gases trigger reactions in a new electronic nose, a sensor which uses dyes to correctly identify an array of chemicals. Clockwise from top left are chemical fingerprints of ammonia, arsine, chlorine, hydrogen cyanide, hydrogen fluoride and hydrogen sulfide.

K. Suslick, UIUC

A new sensor sniffs out noxious gases with on-the-nose accuracy, identifying chemicals including ammonia and hydrogen cyanide in less than two minutes, researchers report online September 13 in *Nature Chemistry*. A handheld, inexpensive prototype of the new nose is already underway. And the researchers hope the device may soon provide chemists or first responders to a chemical spill with a wearable detector, much like the badges worn to detect radiation.

The nose is a high-tech litmus test, says Kenneth Suslick of the University of Illinois at Urbana-Champaign, who led the new work. A postage-stamp–sized array of 36 dyes, selected from hundreds for their reactivity, is printed on glass,

paper or plastic. Some of the dyes react strongly to electron-donating molecules, for example. Exposure to a particular gas yields a specific pattern of colored dots, providing a chemical fingerprint. This fingerprint is then matched to a database, exposing the culprit chemical.

Tests with gases diluted to different concentrations and tests in air with varying humidity suggest the nose knows one toxic chemical from another. The trick, Suslick says, was designing a nose of many parts, in which each dot of dye could undergo a strong reaction. The nose could interpret the collection of reactions together, akin to how the brain interprets a mixture of molecules as one scent.

“This is the exact opposite of a lock-and-key model,” Suslick says. “Mother Nature evolved an array detector — no one response is specific, but the overall pattern of response is specific.” Other approaches typically rely on less-specific reactions, Suslick says. Those techniques have a harder time distinguishing among some molecules and nosing out chemicals at low concentrations.

Previous research by Suslick produced a similar nose that could distinguish among 18 commercial beers (SN: 7/15/06, p. 40).