



**Chemical-Sensing Camera**

## Paper Nose Detects Toxics

*By David Bradley,  
Discovery.com News*

**Aug. 16, 2000** — A small slip of paper that can sniff

out odors simply by changing color has been developed by U.S. chemists. The dye-coated slip could be used to detect deadly toxins, poisonous gases in chemical warfare, and environmental pollutants. It could even find use in the food industry for spotting sour milk and food that has gone bad.

Kenneth Suslick and Neal Rakow of the University of Illinois describe their paper nose in this week's *Nature*.

"Everything that smells strongly, including most toxins, can 'stick' to metal ions embedded in a dye," Suslick explained. "When they do, the dye molecule changes color." This color change is the key to how the team's artificial nose works.



**Chemically Sensitive Dyes**

When an odor molecule lands on a spot of dye on the piece of paper, it sticks to a doughnut-shaped molecule called a metalloporphyrin. This reaction causes the dye to change its color.

Suslick and Rakow call this effect "smell-seeing." They have built an array of spots containing different metalloporphyrins on a slip of paper. Each spot gives a slightly different color change depending on the molecules that stick to it. This way, they can sniff out lots of different odors at once or get a color "fingerprint" pattern for an environmental sample.

"Our technique is similar to using litmus paper to determine if a solution is acid by seeing if the paper goes from blue to pink," added Suslick.

The team has set up a color scanner attached to a PC that takes snapshots of the sample strips before and after exposure to a smelly substance. Software is then used to subtract the "before" image from the "after" image to get a much more accurate comparison.

"By comparing that pattern to a library of color 'fingerprints,' we can quickly identify and quantify the chemical compounds present,"

Suslick said.

Suslick believes his smell-seeing arrays could be used in the food and drink industry to detect flavorings, additives or food spoilage. Customs officials could quickly sniff out explosives and illegal drugs while the perfume industry could spot fakes quickly.

"Because the dyes are waterproof and easy to see, they will have many uses in real-world situations," said Ingemar Lunström of Linköpings University in Sweden.

The team has patented the technique and is now working on a portable "smell-camera" that could take an aroma snapshot.



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