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UI scientists say smells are really quite a sight to see

By PAUL WOOD

URBANA – Given your druthers, would you rather smell a rotten egg, or see it?

Seeing is smelling – through new devices invented at the University of Illinois. The lead researcher predicts "smell-visualization" products could be on the market in as little as two years.

They could allow factories to monitor toxic emissions in an empty room, help microwaves "know" when a baked potato is fully baked, or tell a homeowner where Fido is peeing on a rug.

"Not all smells are bad, but all smells are chemicals," said Kenneth Suslick, the UI's William H. and Janet Lycan Professor of Chemistry, who has done ground-breaking work in materials science.

Suslick and a graduate student, Neal Rakow, have developed rapid ways to detect smells – using inexpensive equipment – based on how they react with dyes.

The dyes, doughnut-shaped metalloporphyrin molecules, are similar to those used in the fabrics industry. They can easily be used on any white background.

"Inorganic chemists know something that most biologists don't know: Everything that smells strongly, binds strongly to metal ions," Suslick said.

In the process, the reaction causes the dyes to change color, giving a distinctive signature for the smell.

"Every smell has a fingerprint," Suslick noted. And the necessary reactions generally take less than 30 seconds.

There are several ways to make records of the chemical changes. In the lab, Suslick and Rakow use a flatbed scanner, bought off the shelf, attached to a small hose. The mobile version is a cheap digital camera equipped with a plastic snout to hold the sample-sniffer.

Suslick says science has had the technology for half a century to make these devices.

"Fifty years ago, they could have done it on (photographic) film," he said.

Similar processes are evident in nature. Blood has a different color in a vein or an artery because oxygen alters it. Chlorophyll, the green pigment in plants, also is color-sensitive.

Scientists have used litmus paper for decades to judge acidity as the paper goes from blue to pink. The papers made by the UI team react to a variety of vapors, each in a specific way.

Suslick can look at a paper, or its digital record, and "read" the picture of the dots. Rum looks somewhat similar to rotten fruit, because both involve fermentation.

Monitors could be individualized for specific odors. Among the uses Suslick sees are applications to detect flavorings, additive or spoilage in foods and beverages; to identify counterfeits in the perfume industry; at customs checkpoints to detect banned substances; and in the workplace to detect toxins.

The devices can be superior to the human nose. We don't smell oxygen or carbon monoxide because they're part of the chemical factory of our lives, he said, but the dyes do react to lethal carbon monoxide.

Most noses are sensitives to compounds at a few parts per million. The artificial nose is 10 to 100 times more sensitive, Suslick said.

The UI could benefit financially from any commercial uses for a visual sniffer. Suslick and Rakow are applying for a patent.

Then you can buy a refrigerator that tells you, "Hey, throw out whatever's in that blue Tupperware!"