Researchers develop high-level gas detection system

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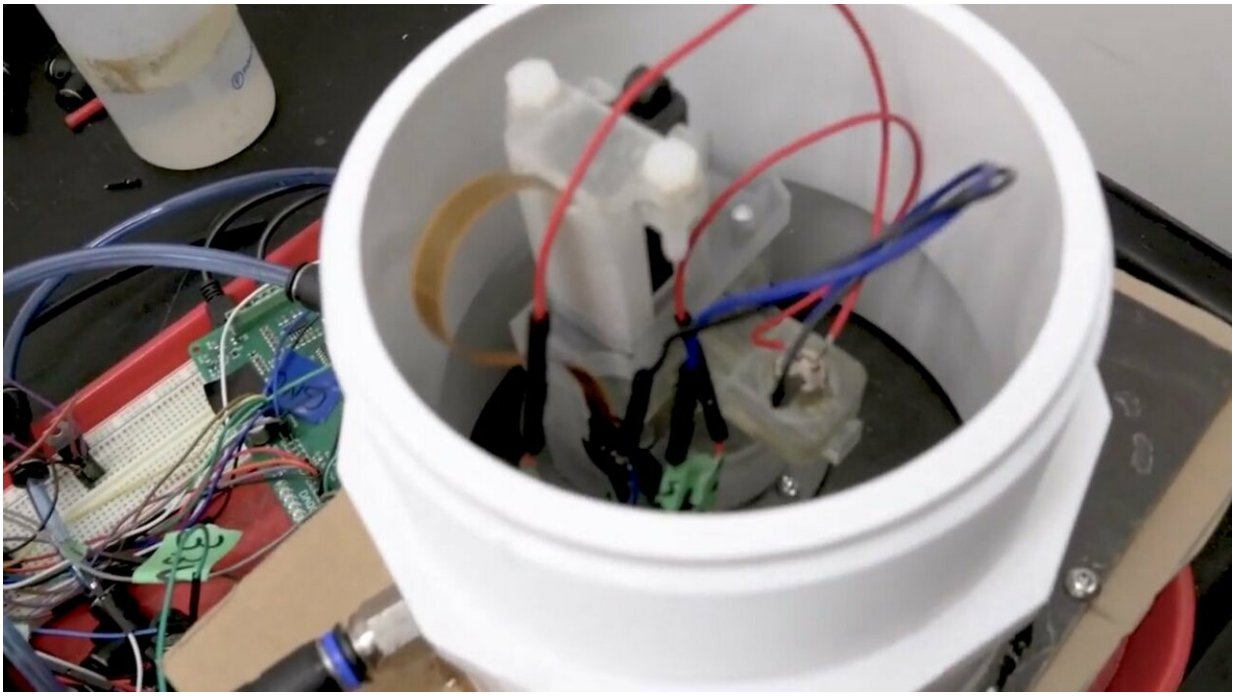

A new gas detector, developed by researchers at UBC's Okanagan campus, enables highly accurate odour analysis for so many different applications it has been nicknamed the 'artificial nose.'

Researchers in the School of Engineering have developed a state-of-the-art microfluidic gas detector that can detect small traces of gases quickly

and efficiently. It has a number of potential uses including environmental monitoring, food and beverage quality assessments, and biological and chemical analytical systems.

The device, explains Professor Mina Hoorfar, is essentially 'an artificial nose' that can smell any sort of odour including noxious substances like natural gas, ammonia or sewage.

"Our sense of smell is one of the most important abilities humans have," says Hoorfar. "Our nose affects the quality of our lives significantly and helps with the detection of toxic gases in the environment, fire awareness, spoiled food or triggering memories. With this in mind, there has always been interest in developing devices that can mimic human olfaction systems."

The tiny gas detectors, developed in UBC Okanagan's Advanced Thermo-Fluidic Laboratory, consist of 3-D-printed parts, which create the microchannel and a metal oxide semiconductor. The detectors can be connected to a sampling chamber or be used in a lab environment.

Doctoral student Mohammad Paknahad, one of the lead researchers in the project, says the tiny detector uses two different channels and each channel has a different coating. During tests, several target gases from different families of volatile organic compounds were used including alcohols, ketones and alkanes. Paknahad says when a sample passes through the detector, the internal coatings direct the gases to the appropriate sensor where it is immediately analyzed.

"The gases interact differently with the channel coating and this is why it is called 'like dissolves like,'" says Paknahad. "Our research demonstrates that these low-cost detectors can be custom-made for different applications while maintaining accuracy and precision."

The technology—comparing two separate gas detectors with channels outfitted with special coatings that act differently when exposed to different gases—provides the user with the ability to adjust the coating based on the desired target gas.

"There are many examples of highly accurate systems," says Hoorfar. "But despite their accuracy, the size and cost of these systems limit their applicability in the detection of volatile organic compounds in numerous applications that require portable and easy-to-use devices. Our devices offer a small, inexpensive and highly-accurate alternative."

"This has the potential of changing the way municipalities and utilities conduct their monitoring," says Hoorfar. "Based on the initial reaction of our municipal partners, we are excited to see what lies ahead."

The research was published in the journal *Scientific Reports*.

More information: Mohammad Paknahad et al, Selective detection of volatile organic compounds in microfluidic gas detectors based on "like dissolves like", *Scientific Reports* (2019). DOI: 10.1038/s41598-018-36615-6

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