Easily observing environmental pollution-causing harmful substances through a mobile phone camera

March 29 2024

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DGIST's Physics and Chemistry Professor Park Jin-hee and her research team have developed a technology that allows easy detection of

hazardous chemicals. Allowing one to detect harmful substances by analyzing color changes using a mobile phone camera, the technology is expected to be utilized for various purposes, such as the detection of environmental pollution and prevention of gas leakage.

"Volatile organic compounds" are harmful chemicals that are widely present in the environment. They enter the environment through factory gases, indoor air, and other sources and cause pollution and sometimes even illnesses. Therefore, it is vital to detect them quickly. Traditional detection methods are either expensive or can detect only a limited number of chemicals.

To solve this problem, Prof. Jin-hee Park and her team have developed a sensor that uses a material called "metal-organic framework" to induce color changes. The sensor has been created using six different solvents, which can distinguish between 14 volatile organic compounds and water. To enable the observation of color changes with the naked eye, the team has developed large-area films that can be easily produced at a low cost.

By analyzing color changes using a mobile phone, it is possible to detect, qualitatively and quantitatively, low concentrations of harmful compounds that are difficult to detect with the human nose. The sensors may be used for various purposes, such as environmental pollution detection and gas leakage prevention, as they perform well even in high-humidity environments.

"The sensors we have developed have great commercial potential because they are operable without power and implementable at low costs," said Prof. Lee. "With these sensors, we look forward to securing source technologies to develop sensors for various purposes, such as environmental pollution detection, terrorism prevention, and safety accident prevention."

The research is published in the journal *Advanced Materials*.

More information: Kangwoo Jin et al, Comprehensive Qualitative and Quantitative Colorimetric Sensing of Volatile Organic Compounds Using Monolayered Metal–Organic Framework Films, *Advanced Materials* (2023). DOI: 10.1002/adma.202309570