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## Sensors for Continuous and Quantitative Tracking of Airborne Chemicals

Chemical sensors are useful in detecting many airborne chemicals for monitoring air quality, studying environmental health, and protecting people from harmful chemical exposures. Major efforts have been made to develop low cost and high performance chemical sensors. Electrochemical and metal oxide semiconductors are widely used airborne chemical sensors, but have poor selectivity and calibration burdens. Colorimetry is a well-known and widely used sensing platform that detects a color change associated with a reaction between a target chemical and sensing materials. When used in an array format, colorimetric sensing is able to sense multiple analytes in parallel. However, because most colorimetric reactions are irreversible, today's commercial colorimetric sensors are typically single use and for qualitative or semiquantitative analysis only. For these reasons, colorimetric sensors are not suitable for applications that require continuous and reliable quantitative sensing.

Researchers at the Biodesign Institute of Arizona State University have developed a novel gradient-based colorimetric sensor platform for continuous monitoring and quantitative analysis of airborne chemicals. Analytes are transported across a colorimetric sensor surface to create a color gradient that shifts along the transport direction over time. The sensor uses an imaging processing algorithm to track the gradient shift with submicrometer precision and convert it into analyte concentration in real time. The sensor was validated with reliable and quantitative detection of ozone over a 70 hour period.

This novel system overcomes the limitations of traditional colorimetric sensors to provide continuous and quantitative monitoring of multiple airborne chemicals in a miniature and portable format.

### Potential Applications

- Tracking of airborne chemicals
  - o Monitoring air quality, particularly ozone and carbon monoxide
  - o Studying environmental health
  - o Sensors to protect people from harmful chemical exposures

#### Benefits and Advantages

- Low cost with simplified sensor fabrication
- Easy and simple to use
- Prolonged sensor lifetime
- Submicrometer gradient shift tracking precision and continuous monitoring of multiple ppb-level chemicals
- Lightweight and miniaturized for portable and personal use
- Doesn't require a pump
- Continuous and quantitative over an extended period of time
- Sensitive, even in the presence of common air pollutants

For more information about the inventor(s) and their research, please see [Dr. Tao's departmental webpage](#)

For more information about this opportunity, please see [Tao et al – Anal. Chem - 2018](#)