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Colorimetric Sensors for Multiplexed Detection

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. Colorimetric sensors are useful in many applications including sensing toxic chemicals in air as well as detecting biomarkers in breath, urine, blood and other types of body fluids. In multiplexed detection, a light source is used to illuminate the sensing material and an optical system is used to collect the light and form an image on an imager, such as a CMOS imager. While the light source is simple, the optical system can be quite complicated and makes it difficult to form a compact device.

Researchers at the Biodesign Institute of Arizona State University have developed novel chemical CMOS (CCMOS) sensors for sensitive and multiplexed detection and analysis of analytes. These CCMOS sensors integrate the sensing array with the CMOS imager to eliminate the need for additional optics or complicated algorithms. Using novel application methods, the sensor array is formed directly on the top surface of the CMOS imager. The sensor arrays can have different compositions on each element that are able to be tracked and identified.

Because this CCMOS sensor integrates the sensor array with the CMOS imager, it is able to overcome the deficiencies in conventional multiplexed colorimetric sensors to enable highly sensitive analyte detection in a compact and simple format.

Potential Applications

- Medical diagnostics
- Industry safety
- Air pollution monitoring
- Food safety
- Patient bed-side monitoring
- Other sensors – POC, wearables, etc.

Benefits and Advantages

- Sensor arrays can be created with different compositions for each sensing element
- Each sensing element can be measured and tracked/identified
- Highly sensitive and rapid chemical sensing
- The sensing solutions may contain other components to improve the sensors' performance such as sensitivity and lifetime
- The colorimetric sensing recipes can be reversible or irreversible depending on the specific chemical reaction
- Can work with airborne molecules or molecules in solution

For more information about the inventor(s) and their research, please see

[Dr. Tao's departmental webpage](#)

[Dr. Tao's laboratory webpage](#)