Ultralow Power Gas Sensors for Environmental and Safety Applications

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The trend toward pervasive, highly distributed sensing, mobile sensing and reliance on "the cloud" to help to transform raw data into situational knowledge is driving the need for smaller, faster and lower power sensors, which can be mass produced reliably. Increasingly, these sensors must also be compatible with wireless communications and power scavenging schemes which also drive size and power consumption needs. These sensors and systems are needed by first responders, industrial and commercial facilities, environmental monitoring efforts and private citizens for various needs involving rapid detection, classification and notification, from Chem-Bio incident response to occupational safety, greenhouse gas evaluation and basic home security.

Amperometric gas sensors are a well-known and generally accepted type of gas sensor with many desirable performance characteristics , including good sensitivity, selectivity and detection limit for toxic gases, and relatively low power requirements (10s of mW) [1]. We will discuss selected, emerging applications of the new printed amperometric gas sensor developed at KWJ Engineering [2-4]. This sensor is fabricated using modern printed electronics strategies. It is small, inherently low power (microwatts) and is compatible with mobility demands (e.g., cell phones). This platform has performance competitive with existing commercial amperometric gas sensors. The device provides a new avenue to high-performance, low-cost monitoring of electroactive toxic gases, with high sensitivity, high selectivity, low detection limit, long-life and durability. Its performance surpasses what is possible with other typical low-cost sensors, such as heated metal oxide semiconductors. The printed devices described here aim to bridge the cost-performance gap in gas monitoring applications, making high performance gas sensing more widely available than has been possible previously.

This report will discuss recent experimental results using the printed platform to monitor several important toxic and environmental greenhouse gases, including carbon monoxide (CO), ozone (O_3), and carbon dioxide (CO_2).

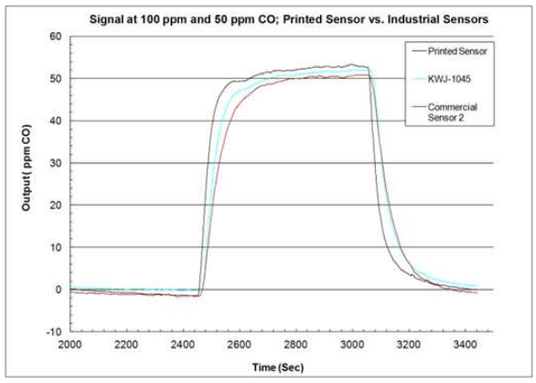

Figure 1. Comparison of response and achievement of steady state at commercial and printed amperometric sensors exposed to 50 ppm CO in air at room temperature.

References

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