

Robust and Rapid Detection of Mixed Volatile Organic Compounds in Flow Through Air by A Low Cost Electronic Nose

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1. Calibration Procedure:

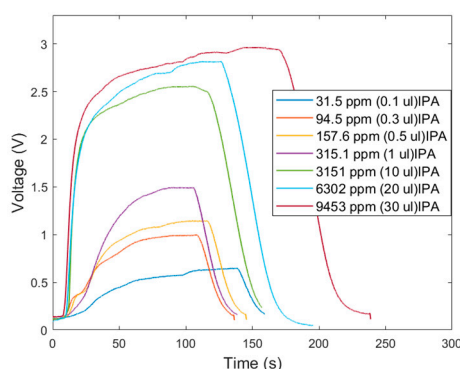
The MOS sensors are calibrated in a sealed chamber to select an appropriate load resistor R_0 to make it sensitive to VOC gas concentrations in the range of 10 ppm–1000 ppm. The concentration of VOC gas (C_{VOC}) in the sealed chamber from volatilized liquid sample can be calculated using the following equation:

$$C_{VOC} = \frac{VdRTv\%}{CPM} \quad (1)$$

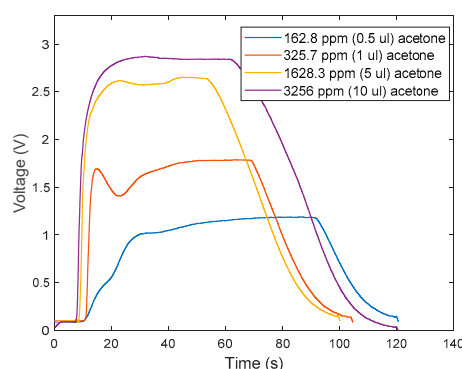
where V is the volume of liquid sample (μL); d is the density of the liquid solution (kg/m^3); R is the gas constant ($R = 8.3145 \text{ J K}^{-1} \text{ mol}^{-1}$); T is temperature (K); $v\%$ is the volume fraction; C is the volume of the chamber (L); P is the air pressure (kPa); M is the molar mass of the VOC gas (g/mol).

The calibration includes three steps:

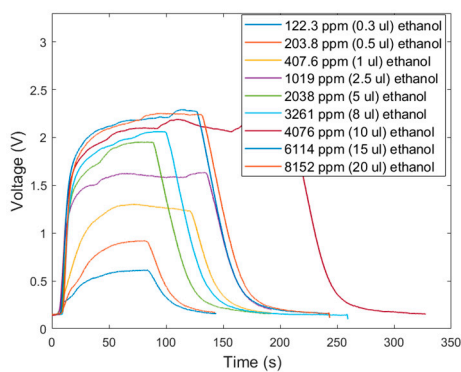
- 1.) The sensors with initial load resistors are first connected on a breadboard and were put into a sealed chamber;
- 2.) Certain amounts of solutions (e.g., 0.5 μL –1 μL –5 μL –10 μL) are added into a 1-L chamber, the gas concentration in the chamber (after several minutes when the liquid sample volatilized) can be calculated by the equation $C_{VOC} = \frac{VdRTv\%}{CPM}$; Voltages are monitored during this process; Load resistor is adjusted to make sure each sensor have a sufficient response to a low concentration and still wouldn't get saturated at a relatively high concentration;
- 3.) The sensors with the selected load resistors are soldered onto a PCB board ready for use.



(a)



(b)



(c)

Figure S1. Calibration curves of the sensor TGS 2602 for different concentrations of (a) IPA, (b) acetone and (c) ethanol. The measurement is done in a sealed box at room temperature and $50 \pm 5\%$ RH.

2. Repeatability Test of the Four MOS Sensors over 7 Days:

A set of experiments was conducted to gauge the day-to-day output variations of the four sensors chosen for this work. They are tested with 10 mL ethanol in a closed box once per day for 7 days. The outputs can be seen in Figure S2.

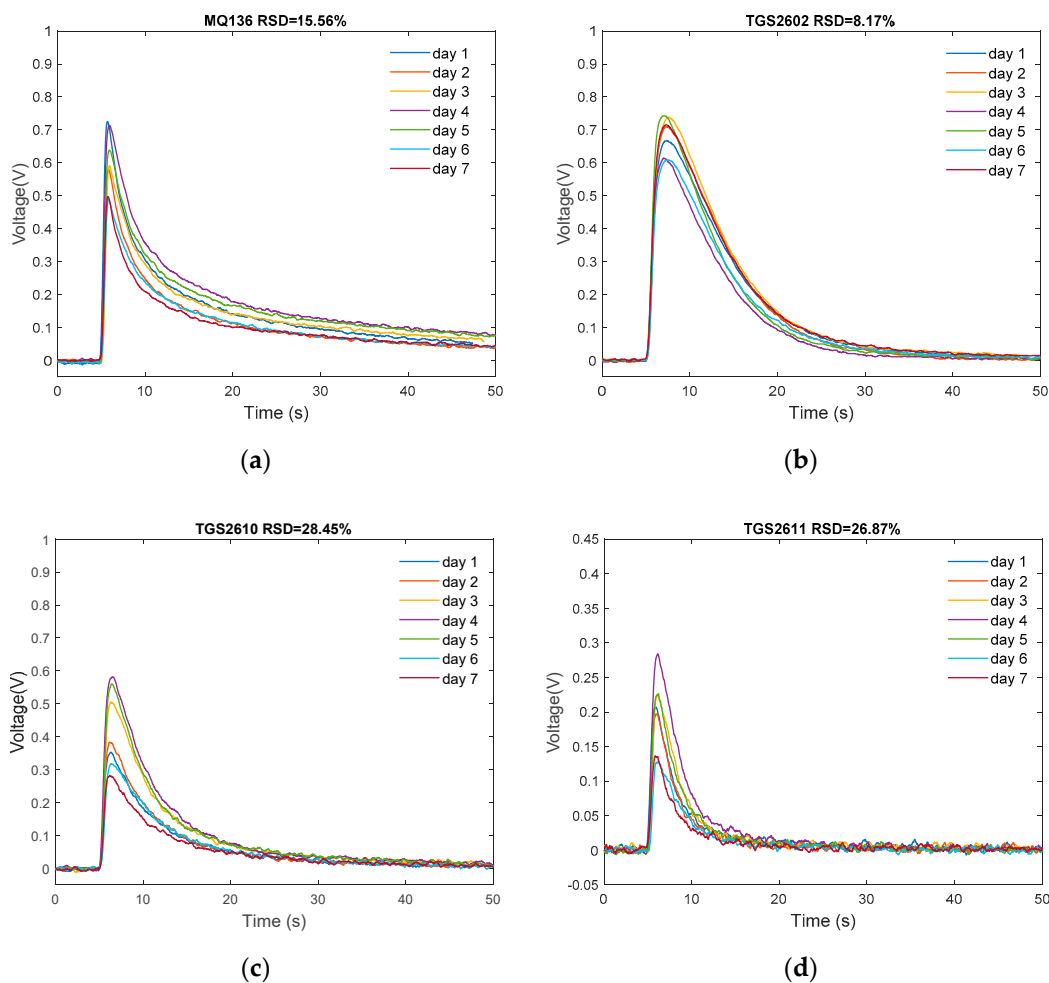


Figure S2. Output curves of (a) MQ 136, (b) TGS 2602, (c) TGS 2610 and (d) TGS 2611 over a period of 7 days.