Optimising ETO Sensor for Measuring Specific VOCs

Introductiont

This technical note provides guidance for the optimisation of the operating conditions required for detecting alternative gases or VOC's using an ETO sensor. To do this you will require-

i) ETO-A1 or B1 sensor

ii) Control and measurement electronics, capable of applying bias potentials between 0 V and 0.5 V. We recommend our Toxic Sensor Evaluation Board (UMTOX-2).

iii) Gas hood that fits securely to the sensor, allowing a flow of gas between 300 sccm and 500 sccm.

iv) Accurate DVM, datalogger or oscilloscope.

v) Stable variable potential voltage supply.

This document will assume that the Toxic Sensor Evaluation Board (UMTOX-2) is being used in the study. Read the User Manual (072-0128) before proceeding.

Set-Up

We will be using the UMTOX-2 in bias mode so ensure that the bias link LNK2 is in positions 2 and 3. Ensure that link LNK1 is disconnected to disable the shorting FET. Fit the ETO-A1 sensor to the circuitry and ensure that the circuit is powered (either batteries or power supply). Apply a very small 50 mV potential through the input terminals. Measure the working electrode potential relative to the potential of the reference electrode using a DVM. If this potential reads +50 mV then proceed to the next section. If the potential reads -50 mV then reverse the input polarity on the terminals and re-measure. Readings other than this require a more in-depth inspection of the electronics starting with set-up and power.

Procedure

Since we are investigating the gas sensing capabilities of ETO-A1 sensors for gases other than ethylene oxide (ETO) it is worth noting some basic guidelines. The recommended potential range for these sensors is 0.0 to 0.5 V. Whilst it may be possible to operate the sensors outside of these limits it is not advised and may invalidate warranty. The user must first define the target concentration range of the target gas. Generally it is best to work close to the lower limit of this range in order to have a better measurement of noise/interference. We will define this concentration as the initial measuring concentration. (IMC)

Once the IMC has been determined we are ready to begin testing. The test can be procedurised as follows:

1) Ensure that the gas hood is fitted to the sensor and apply air at about 300-500 sccm. Set the measurement potential to 0 V.

2) Convert the output potential to current using the supplied conversion factor (for UMTOX-2: 10 uV/nA).

3) Once the zero current is <300 nA we can begin testing. Apply the IMC of the target gas to the sensor. If there is a response to the gas the current should rise to a steady value. If a datalogger is used and the gas has been applied without pressure spikes it will be possible to determine the t90 (s) of response/recovery as well as the sensitivity (nA/ppm).

4) Increment the applied bias potential by 50 mV and return to step 2 until the final applied potential is 500 mV.

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At this stage you should have a range of sensitivities (nA/ppm) at bias voltage potentials between 0 V and 500 mV in 50 mV increments. You may also have zero output and t90 response/recovery, which are useful information.

Further Tests

Assuming that you have found a good bias potential for your target gas, you may now wish to consider further experimentation.

We advise that your testing should be performed at potentials near the optimised working potential of the sensor as well as at the optimised potential. These studies might include:

1) Output and Zero Temperature Dependence
2) Cross Interference (with relevant challenge gasses)
3) Linearity Dependence
4) Humidity Dependence
5) Partial Pressure Dependence

Additional Information

If the above procedure does not cover all the required operating requirements, contact Alphasense direct for further guidance at sensors@alphasense.com

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