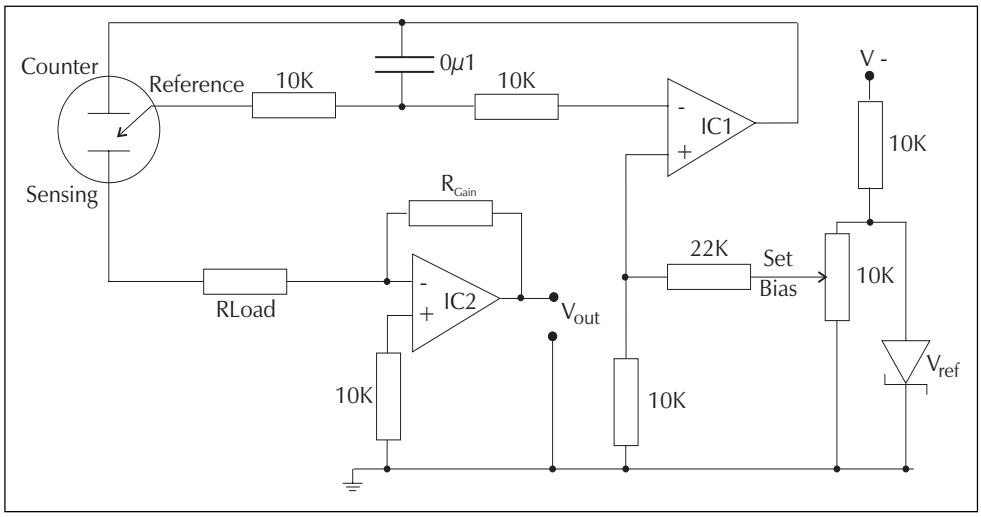
Application Note 8

Biased Operation of 7H Sensors

The rate at which chemical reactions proceed can usually be increased by adding energy to the reactants. For most chemical reactions this can be achieved in one of two ways, either by raising the temperature or increasing the pressure at which the reaction takes place. In an electrochemical cell, where for example H_2S is oxidised electrochemically, there is a third option, namely applying a **bias potential.**

To apply a bias voltage to a three electrode sensor the following circuit is required.

Figure AP8.1.
Recommended circuit for 'biased' CiTiceL operation



For further details on this circuitry please refer to the toxic gas sensor operating instructions section for biased operation.

The performance characteristics of 7H H_2S CiTiceLs were studied when bias voltages between 0 and +300 mV were applied. At each increase in bias, the baseline, sensitivity, response time, and cross sensitivity to a range of gases was measured for each sensor tested. The results of these measurements are shown in figures AP8.2 to AP8.5.

Figure AP8.2
Baseline vs Bias

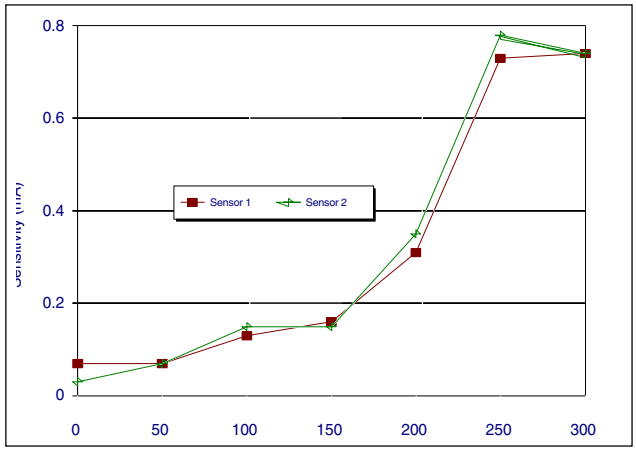


Figure AP8.3
Sensitivity vs Bias

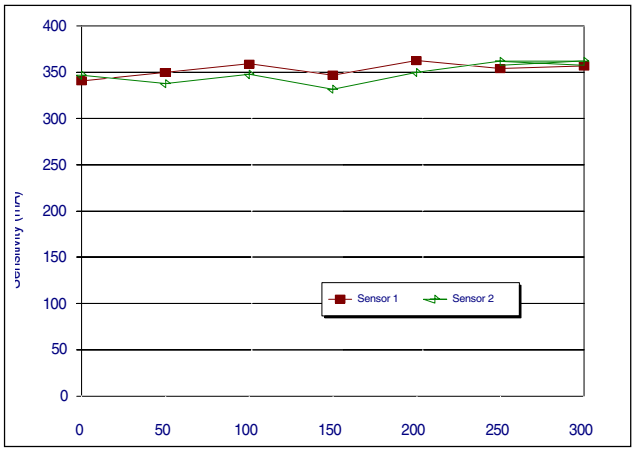


Figure AP8.4
Response Time vs Bias

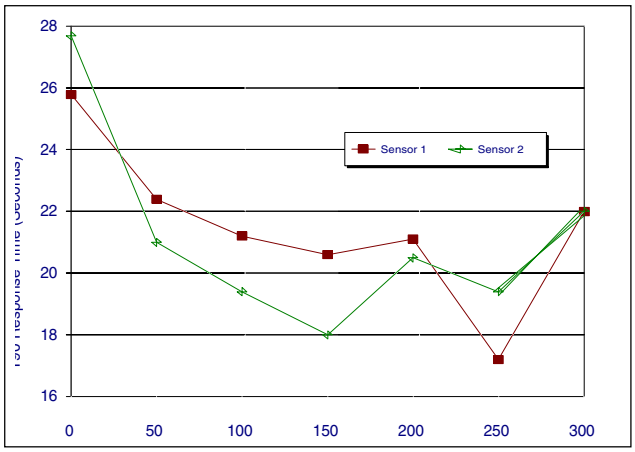
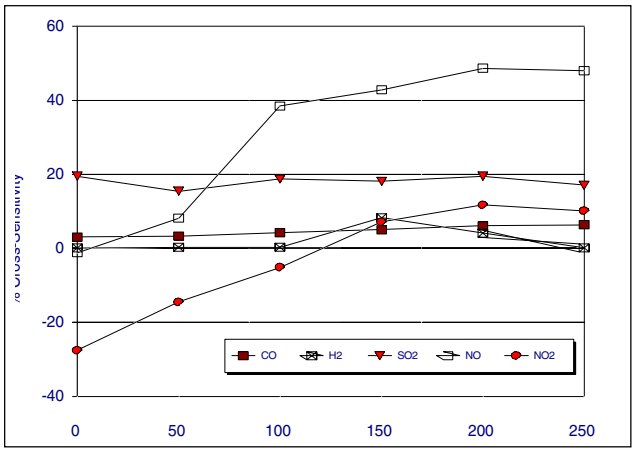


Figure AP8.5
Cross Sensitivity vs Bias



Summary

Response Time:

On examining the data obtained, it is clear that one of the main advantages to be gained by running the sensor at bias is the response time is faster. At 250mV bias T_{90} response times below 20 seconds were observed for both sensors tested.

Sensitivity:

The overall sensitivity to H_2S showed no significant variation with bias potential.

Baseline:

As expected, sensor baselines showed an increase as the bias potential was increased. The steady state baselines were recorded once the sensors had settled as the application or change of a bias potential causes rapidly decreasing baselines.

Cross-sensitivity:

It is interesting to note that the NO_2 response is negative below 170mV and positive above. The other significant variation is in the NO response which becomes more appreciable as the bias potential is increased.