City Technology Limited

January 1999

TECHNICAL BULLETIN

Technical Enquiry of the Month – Long-Term Drift

In December we received an enquiry for the reasons for the drift of toxic CiTiceLs®

The design of an electrochemical toxic gas CiTiceL® is such that it will work for many years, with minimal long-term output drift. Theoretically the output is determined by the size of the 'gas entry' capillary holes. However, this assumes the electrode catalyst has an infinite activity. In practice this is not so and its normal slow degradation leads to a gradual loss of output over the life of the sensor. We have also observed that sensitivity may increase as well as decrease.

There are many factors that may cause the output signal to alter over the life of a sensor in normal use, some of which are: continuous exposure to target gas; exposure to excessive concentrations of target gas; physical damage and excessive changes in the concentration of electrolyte caused by long exposure to humidity levels outside the rated working range. Long-term output stability data is available from City Technology for most toxic sensor types. Please contact Technical Support.

product news

New Products for 1999

This year has already seen the successful launch of the 40X CiTiceL GOLD, the first compact City Technology oxygen sensor with a 2-year life. It has also seen the introduction of the A7E, a sensor capable of the detection of formaldehyde. In addition to these new products, our R&D department is currently working on:

- Semistors – a CiTipeL® with a novel patented semiconductor coating to detect ppm hydrocarbons
- Improvements to CiTipeL® poison resistance
- The 9CF CO sensor to partner the 9HH
- Faster sensors such as the MOX-20 Oxygen sensor with a T_{95} of 500ms designed for breath-by-breath oxygen monitoring
- Improvements to the Hydrogen sensors to increase long term signal stability
- Introduction of the 'snap-fit' closure on all 7-Series CITiceLs
- Compact gas generating cells

If you would like to find out more on these developments or have identified an application which would require a custom-designed sensor, please contact the Technical Support Team.

3-Series Black Moulding for greater resistance

Many customers will have noticed a new look to some of the 3-Series CiTiceLs. We are currently changing the plastic used to mould the sensor base and top-plate to a black glass-loaded polypropylene. This material has a greater resistance to solvents and reduces surface crazing which can occur in the presence of some corrosive gases. The 3EU, 3SH, 3SF, 3M, 3HYT are due to change shortly, the remaining sensors will follow when our testing is complete.

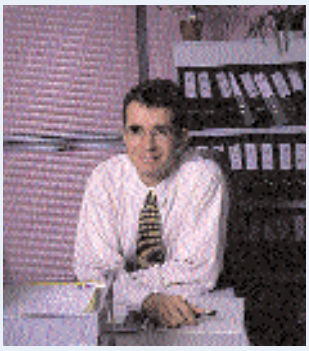
City Technology opens Euro Bank Account

Whilst the British government is yet to make up its mind over Europe, City Technology is forging ahead in their preparations for European Monetary Union. Customers who wish to purchase City Technology sensors in Euros may now do so by making their payments to Account No. 50558001 Sort Code 12-20-10. If you have any questions about converting your account please contact our Accounts Department.

New Faces

Welcome!

We are pleased to welcome four new people to the Sales and Marketing team. Two new Account Managers, Simon Spear and Mauro Lantschner, have been recruited to strengthen the relationships with our customers through regular meetings and continuous account support. Jon Myers joins us to perform the duties which, until recently were carried out by Joanne Kelly (who is currently looking after her newborn baby daughter, Gabrielle) and Stephen Swindley takes on the role of Technical Author.



Simon Spear
Account Manager
Simon is a German-speaking graduate engineer from the University of London. Building on his international experience gained from a related industry he looks forward to the challenge of contributing to our further export growth.

New Faces

Mauro Lantschner
Account Manager

Mauro is Italian and has been resident in the UK for the last ten years. Tri-lingual in Italian, English and Spanish, he has gained extensive experience in the export of UK-manufactured automotive products and is keen to contribute to consolidation of City Technology overall sales.

Stephen Swindley
Technical Author

After studying Applied Physics at Portsmouth University which included a placement in Information Technology, Stephen assumes responsibility for the creation of our technical specifications and Product Data Handbooks. He will also be closely involved in the maintenance of our website and the implementation of our new intranet.

Jon Myers
Market Development Co-ordinator

Jon has recently completed a Business & Marketing degree at Birmingham University and is keen to apply this knowledge to supporting City Technology's marketing effort. He will be identifying new market opportunities via market research and customer feedback and is responsible for all press releases, advertising and promotional activity.

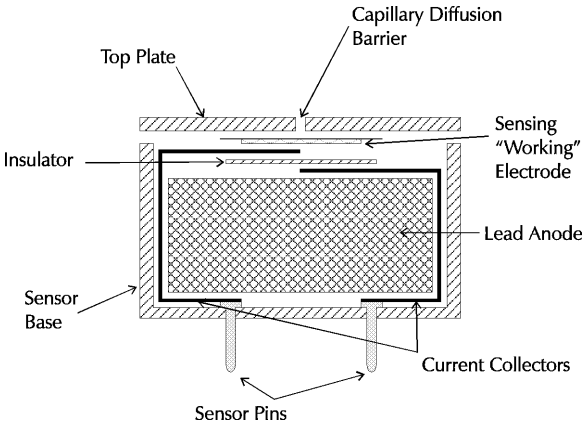
Technical Titbits

This month sees the first in a series of technical articles which explain the design of City Technology gas sensors, how they function and where they can be best utilised. Comments or questions arising from these articles can be directed to Rob White (rjw@citytech.co.uk).

City Technology manufactures a wide range of electrochemical and catalytic bead sensors designed to monitor a large number of different gases. They can be broadly split into three groups: oxygen 'battery type' sensors, toxic 'fuel cell' sensors and combustible 'pellistor' sensors. This first three articles in the series are dedicated to the first group, oxygen sensors and explain how they are designed and how they are used.

Oxygen Sensors 1 – Design Overview

An oxygen cell can simply be considered as an enclosure (either a metal can or a plastic moulding) which holds two electrodes: a flat PTFE tape coated with an active catalyst, the cathode and a block of lead metal, the anode. This enclosure is airtight apart from a small capillary at the top of the cell which allows oxygen access to the working electrode. The two electrodes are connected, via current collectors, to the pins which protrude externally and allow the sensor to be electronically connected to an instrument. The entire cell is filled with conductive electrolyte which allows transfer of ionic species between the electrodes.



The rate at which oxygen can enter the cell is controlled by the size of the capillary hole at the top of the sensor. When oxygen reaches the working electrode, it is immediately reduced to hydroxyl ions:

$$O_2 + 2H_2O + 4e^- \longrightarrow 4OH^-$$

These hydroxyl ions migrate through the electrolyte to the lead anode where they are involved in the oxidation of the metal to its corresponding oxide.

$$2Pb + 4OH^- \longrightarrow 2PbO + 2H_2O + 4e^-$$

As the two processes above take place, a current is generated which can be measured externally by passing it through a known resistance and measuring the potential drop across it. Since the current produced is proportional to the rate at which these reactions occur, its measurement allows accurate determination of the oxygen concentration.

February '99 issue
Pressure transients and coefficients explained

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