



## Application Note 16 **The Advantages of MediceLs over CiTiceLs for use in NO Therapy Measurements**

Much of the early clinical monitoring of NO therapy trials was conducted using sensors from City Technology's 3-series CiTiceL range. The data obtained has been used to address several of the weaknesses found in these early trials and hence to develop the new medical NO<sub>x</sub> sensors which are specific for medical applications. In particular four areas of concern were raised as follows:

- 1) Temperature Stability
- 2) Material Compatibility
- 3) Lifetimes with respect to a) Drift and b) Humidity Tolerance
- 4) Oxygen Sensitivity

### **1) Temperature Stability**

The 3NT and 7NT sensors can have zero currents of up to 10ppm NO and this offset may change with temperature by 10ppm or more purely as a result of ambient temperature variations. This obviously limits the accuracy of the gas measurements unless frequent zero checks are carried out.

The MNO-1 and MNO-2 MediceLs, however, incorporate a new, four-electrode design where the *Auxiliary* electrode largely compensates for this zero shift with temperature. The same innovative concept has been carried over to the NO<sub>2</sub> MediceLs.

### **2) Material Compatibility**

In certain medical environments the 3-series sensors had a tendency to develop cracks along moulded stress lines, or in some instances the whole structure of the plastic was attacked. This problem is an inherent feature of the polycarbonate material used for the 3-series CiTiceLs and hence a different material has been employed for the MediceLs. A 20% glass-filled polypropylene has been specially chosen for its rigidity and its compatibility to the potentially dry medical gas environment.

### **3) Lifetimes**

The 3NT CiTiceL was developed as an ambient monitoring sensor for safety applications and was typically exposed to clean air. In the early stages of testing it became clear that the sensor calibration would drift down under continuous exposure to NO. Further continuous exposure to very dry gas would often



completely dry out the sensor.

To overcome this problem the MediceL design uses a lower sensitivity. This reduces the influx of NO into the sensor, and reduces the rate at which water can be lost. Since the sensitivity has been halved in the MediceL, the time it can withstand continuous exposure to dry NO without developing problems has been effectively doubled.

#### **4) Oxygen Sensitivity**

Tests on the 3NDH showed a variable baseline reaction when switching from air to 100% O<sub>2</sub>.

The cause of this variation has been identified and modifications to the electrode stacking and wicking arrangement have been made to successfully eliminate it.

**Note:** We still recommend the sampling system conditions the R<sub>h</sub> to between 15 and 90% to avoid water balance problems.