

Pi Technical Note 37

OzoSense NM - Non Membraned Ozone Sensor

Introduction

When measuring ozone concentrations in water, a high temperature and high pressure environment can present difficulties. These can include increased chemical reactivity or electrochemical changes, which will result in an incorrect measurement when not accounted for. More delicate sensor materials such as membranes can be susceptible to damage, and reagents like electrolytes can be irreversibly altered and rendered ineffective. When taking these considerations into account, the OzoSense Non Membraned sensor can be an effective, cost efficient solution.

The sensor and how it works

The OzoSense NM sensor is a three electrode potentiostatic system comprising a gold working electrode, a stainless steel counter electrode, and a silver/silver chloride reference electrode.

The sensor uses amperometry to electrochemically monitor the concentration of ozone. A constant potential is applied between the working and reference electrodes and the current that flows due to this is measured between the counter and working electrodes.

As the sample of ozone dissolved in solution passes over the gold surface, it is involved in a series of redox reactions with oxygen as a by-product. This generates a current that is proportional to the concentration of ozone and therefore can be used to create an ongoing measurement.

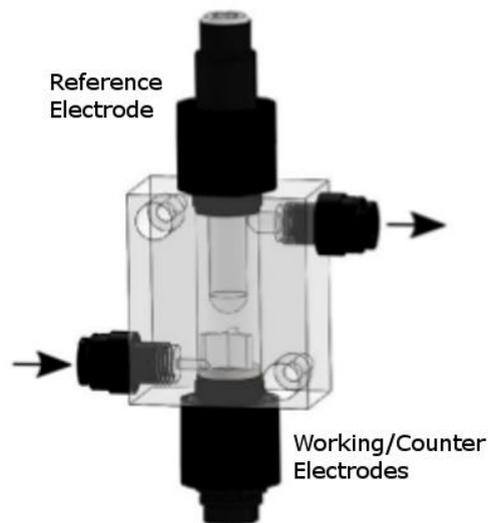


Fig.1 - Non membraned sensor, three electrode potentiostatic system in an acrylic flow cell.

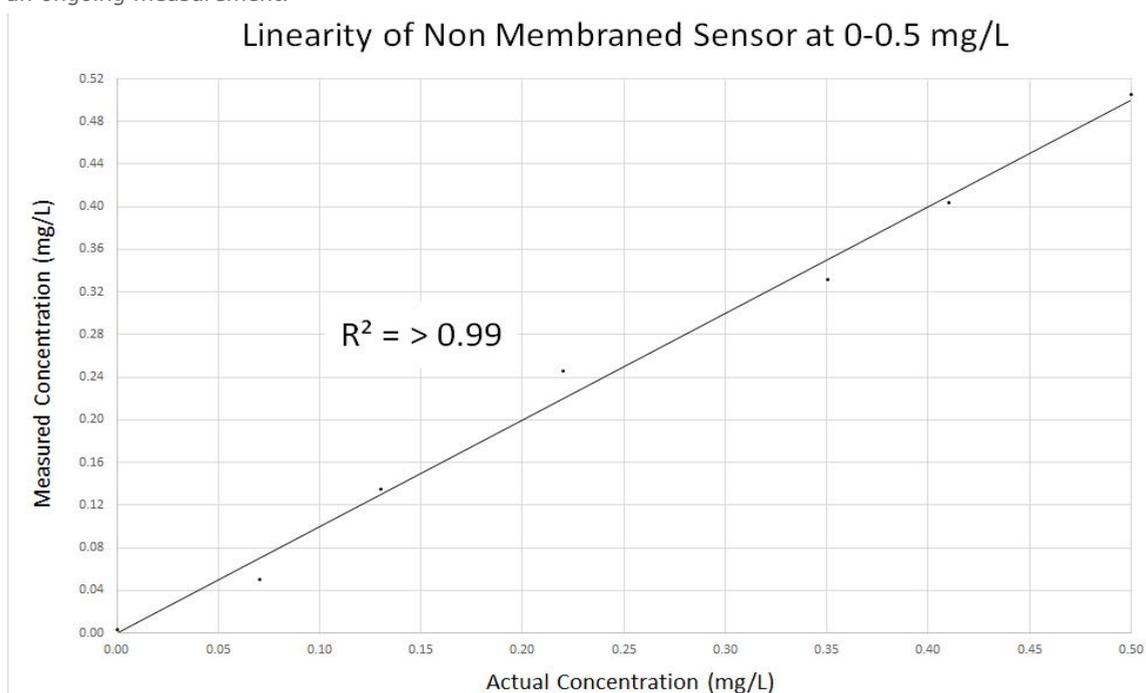


Fig.2 - A graph showing the linear relationship between the concentration measured by the non membraned sensor and the actual concentration.

Environmental Factors

The current measured during this process can be altered by factors other than the ozone concentration. The most significant of these are;

- **Temperature** - Higher temperatures result in higher currents and change the calibration slope. To account for this, the non membraned sensor is fitted with its own thermistor to measure temperature and a compensation calculation accounts for any variations.
- **Flow Rate** - An accurate reading is dependent on the flow rate remaining constant following calibration. To achieve this, a flow regulator is recommended to ensure a consistent flow rate that is unaffected by changes in pressure.



Fig.3 - Flow regulator.

Response Time of Non Membraned Sensor

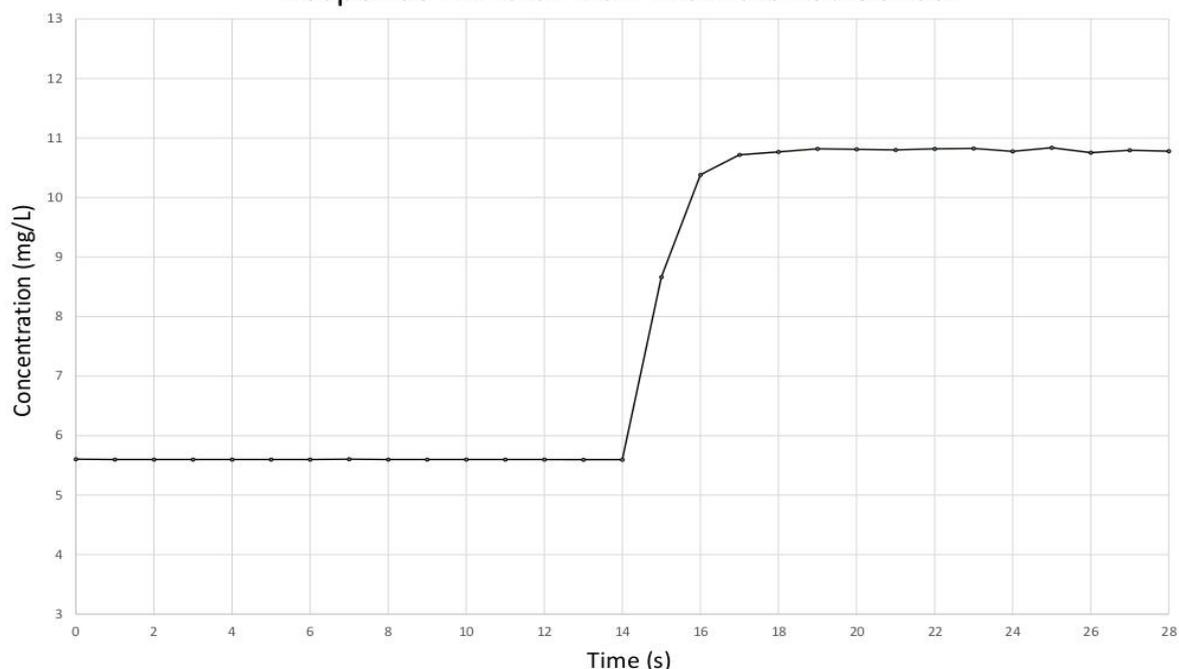


Fig.4 - A graph showing the response time of the non membraned sensor to changes in concentration

Advantages

- **Low Maintenance** - doesn't require electrolyte or other reagents to work.
- **The presence of a third electrode** (the counter electrode) stops current being passed through, and altering the potential of, the reference electrode.
- **Operates at high temperature and pressure (70°C and 6 Bar).**
- **Quick response time ($T_{90} < 2$ seconds).**

Disadvantages

- **Sensitive to interferents.**
- **Restricted cable length (2m).**
- **Sensitive to changes in flow (can be overcome using a flow regulator, see Fig.3).**



Fig.5 - Gold working electrode.

Conclusion

For more information or to find out if the OzoSense Non Membraned sensor is the right choice for your application, check out our [OzoSense Selection Guide](#) or [contact us](#) to speak to one of our salespeople now.