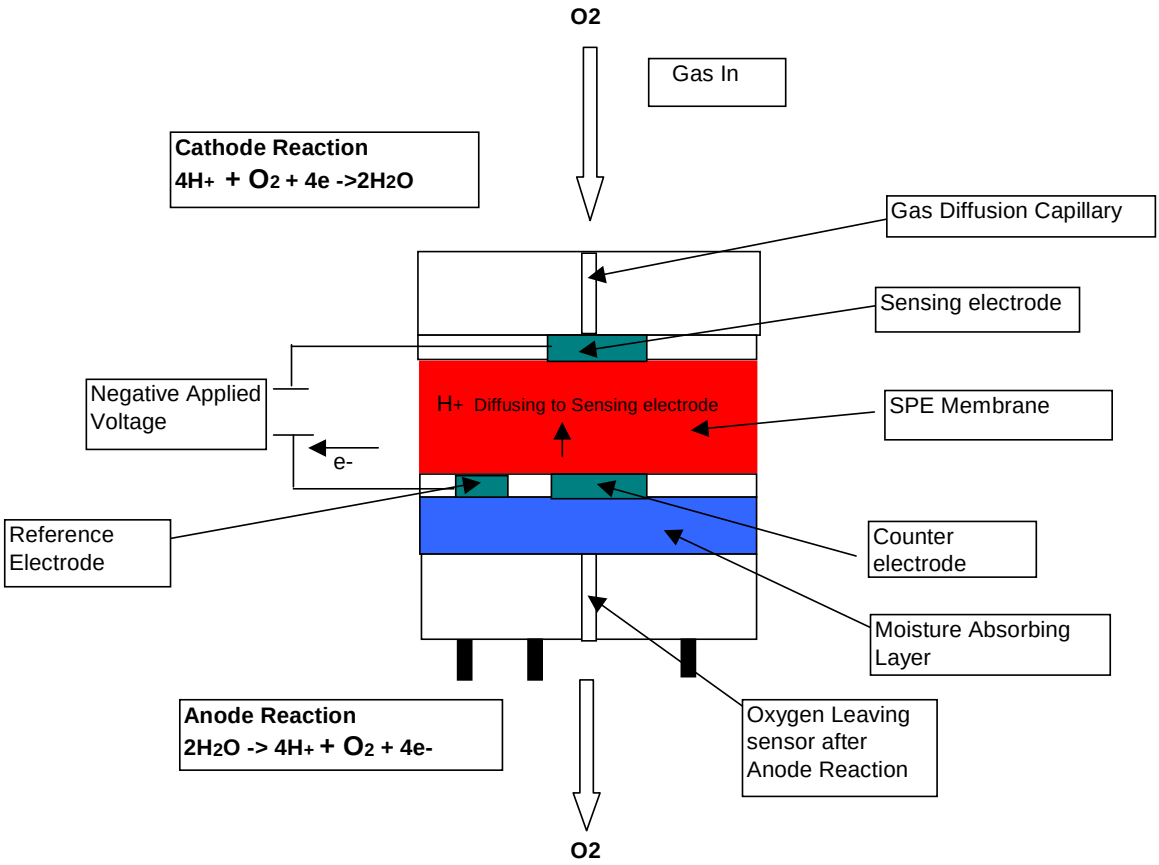
Electrochemical Sensors Application Note 7
EC410 Oxygen Sensor – Operation and Performance

INTRODUCTION

This application note details the build and performance of the SGX Sensortech EC410 oxygen sensor. This sensor has a different mode of operation from existing lead-based electrochemical sensors, which avoids many of the inherent problems with performance and quality seen with existing oxygen sensors.

EC410 SENSOR DESIGN

The EC410 sensor and operation are detailed below:



CATHODE REACTION

A negative potential is applied from the circuit across the sensing and reference electrodes. The sensing electrode is held to –600 mV compared with the reference electrode. Oxygen enters the sensor through the capillary (which acts to limit the oxygen flow into the sensor) and reacts on the electrode surface, being reduced to water. This reaction requires protons. These are generated at the other electrode where water is oxidised to form oxygen and protons. The protons travel across the solid polymer electrode membrane towards the sensing electrode and the oxygen formed leaves the sensor via a vent in the base of the sensor. The water required for the reaction on the counter electrode is supplied from a layer beneath it, which absorbs moisture from the ambient air.

Overall, there is a flow of electrons (current) from the counter to the sensing electrode. This current is amplified in the circuitry, eventually providing a voltage that is measured. The current generated in the sensor is proportional to the concentration of oxygen in the sample.

PERFORMANCE

Full details are given in the sensor datasheet.

- Increased life compared with other oxygen sensors. This is because the EC410 does not contain reagents that can be consumed (such as lead). The sensor lifetime will be more consistent since the lead-based sensors can suffer from inconsistent packing and wetting of the lead anode.
- The volume of liquids within the EC410 sensor is much smaller than that of other oxygen sensors and almost totally contained within the water-absorbing layer. This means that the chances of the EC410 sensor leaking are significantly less than other oxygen sensors.
- The internal pressure inside the EC410 sensor does not change with time. The pressure in lead-based oxygen sensors rises with time, increasing the chances of leakage both internally (causing premature sensor death) or externally (causing loss of sensor life and damage to associated circuitry).
- The EC410 sensor is much lighter than lead-based oxygen sensors. The effect of dropping the sensor is reduced since there is no lead mass to move around which can cause output spikes.
- The EC410 sensor does not contain any toxic metals and is therefore RoHS compliant.
- The sensor response to pressure is as good if not better than other oxygen sensors.
- The size of the EC410 sensor is consistent with other oxygen sensors.
- Absorption of acidic gases from the sample is reduced due to the low pH of the electrolyte within the sensor.