

## **Application Note:**

# **Oxygen Measurements in Bottles Using OxySense Non-Invasive Oxygen Measurement Instrumentation**

### **Introduction**

Measurement of oxygen permeation into bottles can be time consuming and complicated using traditional methods and instruments, such as the MOCON. These instruments are very expensive and can only be used to measure oxygen permeation for a small number of bottles. During the measurement process (which can take several days) the instrument is occupied and cannot be used for other tests. To make oxygen permeation measurements using this type of instrument zero oxygen gas (nitrogen) has to be constantly flown through the bottle. Any oxygen that has permeated through the walls of the PET bottle is collected by this gas and is taken to a sensor that measures the concentration. The permeation tests can last several days during which gas has to flow continuously while the instrument is measuring continuously. This measurement process uses considerable amounts of gas throughout the test and does not represent actual conditions for oxygen permeation into bottles on the shelf.

The OxySense uses non-invasive oxygen measurement technology to determine oxygen permeation into bottles over time. These instruments can be used with unlimited number of bottles to determine the oxygen permeation in each of them. It does not use nitrogen continuously and the permeation rates measured represent actual conditions for bottles on the shelf. The bottles can be empty or filled with product. They can also be tested with the closure attached.

### **Oxygen Permeation Measurements using the OxySense Instruments**

#### **Equipment required:**

Supply of nitrogen, valve assembly, OxyDots and an OxySense Instrument 4000B or 210T

#### **Method:**

- Attach OxyDots to the inside of each test bottle
- Dots can be affixed in the headspace (bottle neck) and/or attached to the middle of the bottle for measurements in the liquid (dissolved)

#### ***Bottles with product:***

- The bottles can then be filled with product and capped. The bottles are now ready for oxygen measurements.

#### ***Bottles without product:***

- To test bottles without product attach a valve assembly with an air tight seal to the top of the bottle (see below) or use an alternative method for purging the bottle.

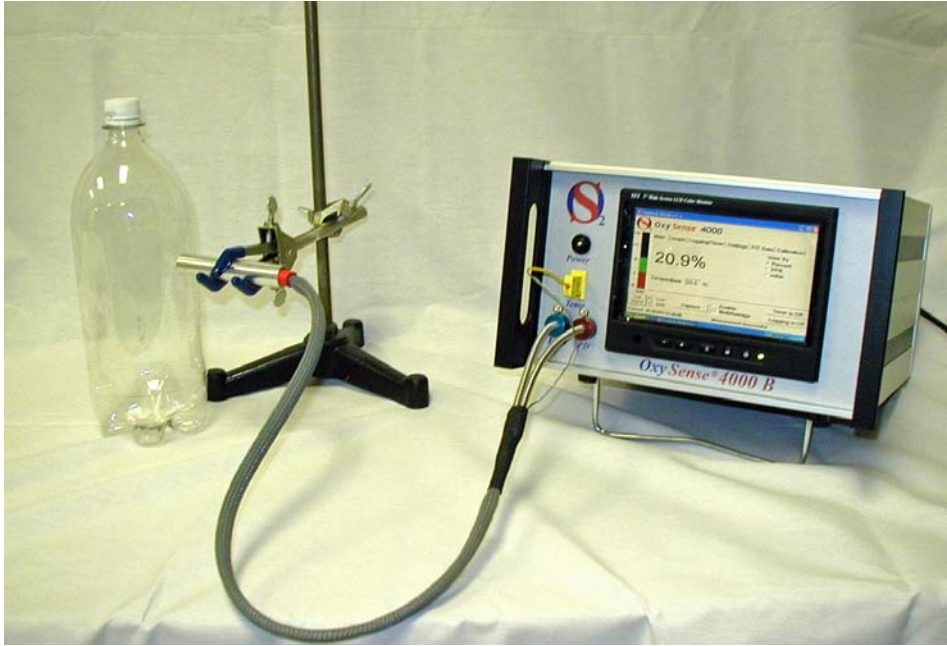


- Purge the bottle with nitrogen to ensure there is no oxygen in the bottle
- The purging process can be monitored using the OxySense instruments
- Once zero oxygen concentration has been achieved close valves on the valve assembly

After purging the oxygen concentration in the bottle can be monitored over time

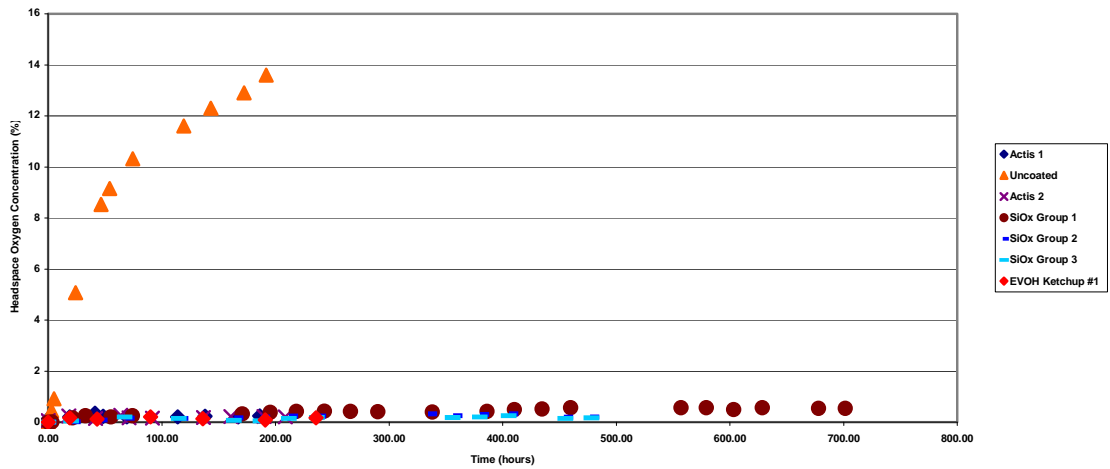
#### Measurement Setup:

- To make measurements align the fiber optic pen with the oxydot (from the outside of the bottle) making sure that the tip of the pen is almost making contact with bottle.
- Adjust the signal level on the OxySense software by using the up/down arrows (bottom left corner) so that the green bar is at the 0 level.
- Then press the capture button to obtain the oxygen concentration in the bottle. The oxygen concentration can be measured repeatedly over time.

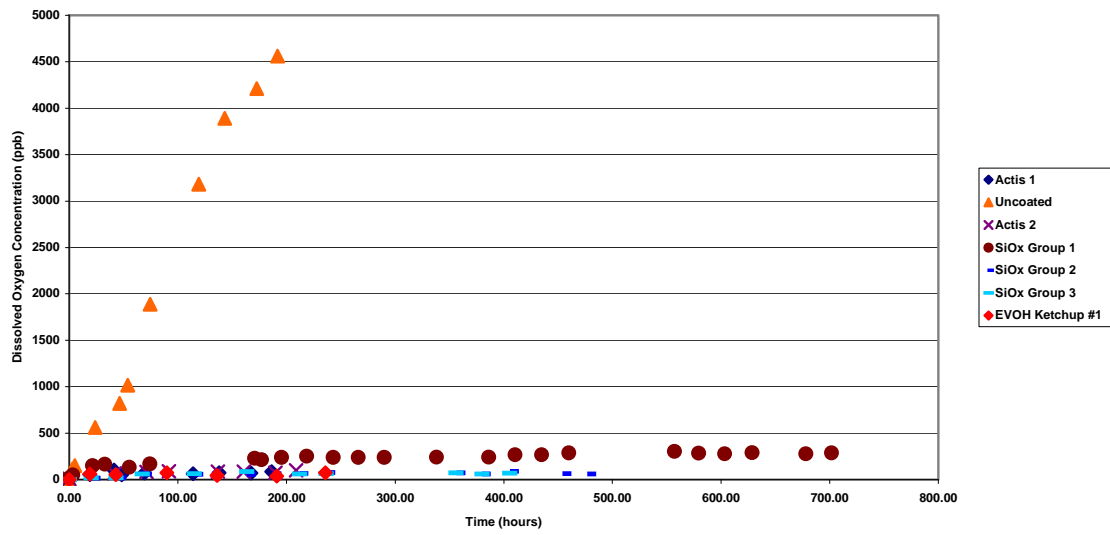


- The data obtained can be plotted and the permeation rate calculated.

**Results:**



Oxygen permeation into PET bottles with different oxygen barriers (headspace) measured over 700 hours



Oxygen permeation into PET bottles with different oxygen barriers (dissolved in liquid) measured over 700 hours