

Oxygen Sensor Probes

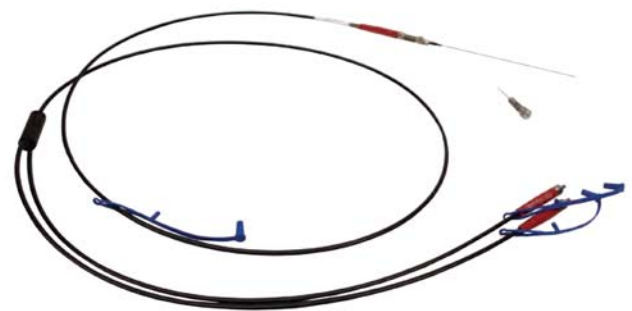
Options for a Wide Range of Sensing Environments

Oxygen sensor probes typically are available in a variety of designs and with each of our standard coating formulations (FOXY, FOSPOR and HIOXY). Custom probes and accessories are also available. In most cases, you'll need a 21-02 Splice Bushing and a BIF-BORO bifurcated optical fiber to couple your probe to the NeoFox electronics. Information on the proper care of probes is available elsewhere in this section.

HypoTube Probes

HypoTube probes are ideal for penetrating septa in packaging, vials and other vessels. The probes are suitable for use in solutions and headspace.

Item:	HypoTube Oxygen Probe
Use:	Puncturing septa, packaging and other rigid materials; especially good for solutions
Core diameter:	300 μm
Outer diameter:	1000 μm
Length:	2 m (assembly), 127 mm (tube)
Ferrule/jacketing:	PVC Monocoil
Reconditioning available:	Yes
Options:	FOXY-HPT-1-PNA general-purpose FOSPOR-HPT-1-PNA high-sensitivity HIOXY-HPT-1-PNA hydrocarbon-ready HPT-PNA (puncture accessory only)

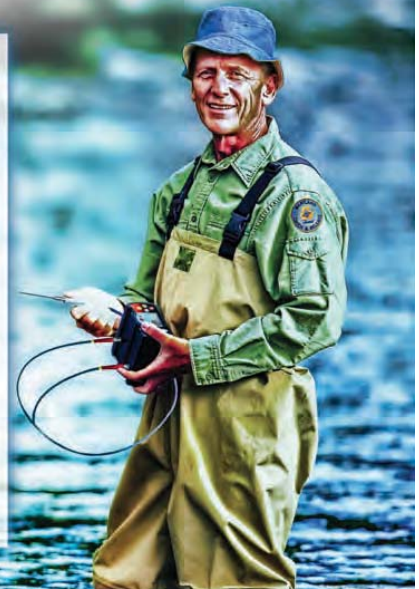


Preserving the Delicate Balance

Take control of environmental responsibility with pH and Oxygen Sensors from Ocean Optics. These patch- and probe-based sensors are ideal for monitoring the quality and safety of wastewater, agricultural runoff and freshwater drinking sources and can help ensure the oxygen and pH stability of fish farm tanks and ponds.

Ocean Optics optical oxygen and pH sensors allow you to take in situ measurements – without harming your sample.

Contact an Ocean Optics Applications Scientist for details.



Visit the new sensors website at www.oceanopticsensors.com

Oxygen Sensor Probes

Options for a Wide Range of Sensing Environments

Electrode-replacement Probes

Our OR125-series probes are designed to replace standard 1/8" (0.125 mm) electrode probes. We offer smooth and O-ring grooved versions.

Item:	Direct-replacement Probes for O-ring grooved electrodes
Use:	Replacement for 1/8" OD (3.175 mm) oxygen electrodes (O-ring grooved)
Core diameter:	1000 μ m
Outer diameter:	3.175 mm
Length:	63.5 mm
Ferrule/jacketing:	Stainless steel, titanium and PEEK versions; smooth or O-ring grooved
Reconditioning available:	Yes
Options:	FOXY-OR125-G general-purpose FOSPOR-OR125-G high-sensitivity HIOXY-OR125-G hydrocarbon-ready FOXY-OR125-GT general-purpose FOSPOR-OR125-GT high-sensitivity HIOXY-OR125-GT hydrocarbon-ready



Item:	Direct-replacement Probes for 1/8" OD (3.175 mm) electrodes
Use:	Replacement for 1/8" OD (3.175 mm) oxygen electrodes (smooth)
Core diameter:	1000 μ m
Outer diameter:	3.175 mm
Length:	63.5 mm
Ferrule/jacketing:	Stainless steel, titanium and PEEK versions; smooth or O-ring grooved
Reconditioning available:	Yes
Options:	FOXY-OR125 general-purpose FOSPOR-OR125 high-sensitivity HIOXY-OR125 hydrocarbon-ready



Polyimide Probes

Choose a polyimide probe for applications where the sample environment is hostile to metallic probes. Polyimide also offers good resistance to harsh chemicals. Note: The 200 μ m version of these probes is less robust and should be handled carefully. Contact us about custom probe lengths and availability of HIOXY formula probe coatings.

Item:	Polyimide Probes
Use:	Environments hostile to metallic probes
Core diameter:	200 μ m and 600 μ m versions available
Outer diameter:	710 μ m
Length:	2 m (other lengths available)
Ferrule/jacketing:	Silicone
Reconditioning available:	Yes
Options:	FOXY-PI600 and FOXY-PI200 general-purpose FOSPOR-PI600 and FOSPOR-PI200 high-sensitivity



Oxygen Sensor Probes

Options for a Wide Range of Sensing Environments

General-purpose Probes

Stainless steel 1/16" (1.587 mm) OD probes are versatile options for a range of lab and other applications.

Item:	General-purpose 1.587 mm (1/16") Probes
Use:	General purpose
Core diameter:	1000 μ m
Outer diameter:	1.587 mm (1/16")
Length:	152.4 mm
Ferrule/jacketing:	Stainless steel
Reconditioning available:	Yes
Options:	FOXY-R general-purpose FOSPOR-R high-sensitivity HIOXY-R hydrocarbon-ready



Item:	General-purpose 1.587 mm (1/16") Probes; short-length versions
Use:	General purpose
Core diameter:	600 μ m
Outer diameter:	1.587 mm (1/16")
Length:	32 mm (other lengths available)
Ferrule/jacketing:	Titanium
Reconditioning available:	Yes
Options:	FOXY-600-32MM general-purpose FOSPOR-600-32MM high-sensitivity HIOXY-600-32MM hydrocarbon-ready



Process-ready Probes

Robust 1/4" (6.35 mm) stainless steel probes have a high pressure rating for process environments.

Item:	Process-ready 6.35 mm probes
Use:	Process environments
Core diameter:	1000 μ m
Outer diameter:	6.35 mm
Length:	177.8 mm
Ferrule/jacketing:	Stainless steel
Reconditioning available:	Yes
Options:	FOXY-T1000 general-purpose FOSPOR-T1000 high-sensitivity HIOXY-T1000 hydrocarbon-ready



Technical Tip

Although our line of oxygen sensor probes is extensive, there may be applications where a different probe design is required. We can coat your custom probe with our sensor material, as long as the probe is polished at a 45° angle to ensure maximum performance. Consult an Applications Scientist for details.

Oxygen Sensor Probes

Options for a Wide Range of Sensing Environments

Small-diameter Probes

Slender, aluminum-jacketed probes work well where sampling space is limited. Standard and tissue-monitoring versions are available.

Item:	Small-diameter, Al-jacketed Probes
Use:	Fine spatial resolution applications
Core diameter:	300 μ m
Outer diameter:	500 μ m
Length:	1 m (other lengths available)
Ferrule/jacketing:	Aluminum
Reconditioning available:	Yes
Options:	FOXY-AL300 general-purpose FOSPOR-AL300 high-sensitivity HIOXY-AL300 hydrocarbon-ready



Item:	Small-diameter Probe for Tissue Monitoring
Use:	Tissue monitoring
Core diameter:	300 μ m (fiber)
Outer diameter:	500 μ m (fiber) 25.4 mm (1") at tip, body 1.6 mm (1/16") stainless steel
Length:	1 m (other lengths available)
Ferrule/jacketing:	Aluminum
Reconditioning available:	No
Options:	FOXY-AL300-TM general-purpose



Respiration Probe

This plastic probe is designed for monitoring oxygen respiration.

Item:	Respiration Probes (Standard)
Use:	Monitoring of oxygen tension in respiratory gases
Core diameter:	200 μ m
Outer diameter:	6.35 mm
Length:	107.9 mm
Ferrule/jacketing:	Plastic
Reconditioning available:	No (uses replaceable glass fiber membranes)
Options:	FOXY-RESP general-purpose FOSPOR-RESP high-sensitivity



Technical Tip – Probe Care

Your Oxygen Sensor probe is very easy to maintain. It can be left in air indefinitely, but don't leave it exposed to your excitation light source when it is not in use. Dropping the probe could cause the optical fiber to break. Be sure not to over tighten the SMA connections.

Cleaning and sterilization guidelines vary by sensor formulation and other variables. Ethylene oxide will sterilize all formulations safely. Be sure to visit our website for details.

Oxygen Sensor Probes

Options for a Wide Range of Sensing Environments

Oxygen Probe Accessories

Accessory options include a needle probe accessory for use with R-series probes and an in-line flow cell option for low-pressure liquid streams.

The flow cell is made of PEEK polymer and includes tubing barbs for 1/16" (1.587 mm) and 1/8" (3.175 mm) ID tubing. It's designed for use in a low-pressure flowing stream of liquid with a peristaltic or positive displacement pump.

Item:	Puncturing Needle Probe Accessories (two needle lengths available)
Use:	Puncturing septa or seals without damaging sensor coating; adapts to standard 1.587 mm (1/16") probes and includes Swagelok adapter
Core diameter:	1000 µm (probe)
Outer diameter:	1.587 mm (1/16")
Length:	152.4 mm (probe) and 63.5 mm (accessory)
Ferrule/jacketing:	Stainless steel
Reconditioning available:	Yes (probe)
Options:	FOXY-R-PNA FOXY-R-PNA-2.5



Item:	In-line Flow Cell Accessories for General-purpose Probes
Use:	Low-pressure liquid flow streams
Core diameter:	1000 µm (probe)
Outer diameter:	1.587 mm (1/16")
Length:	32 mm (probe)
Ferrule/jacketing:	PEEK (flow cell)
Reconditioning available:	Yes
Options:	FOXY-FLOW-CELL



Bifurcated Assemblies for Your Probe Setups

Our BIF-BORO bifurcated optical fibers are designed for optimizing the connection between your oxygen probe and the NeoFox electronics. You'll also need a 21-02 SMA Splice Bushing, which mates SMA-terminated optical fibers and connects the oxygen probe to the bifurcated optical fiber assembly. Both fibers and splice bushings are required for most probe setups and are priced separately. The RE-BIFBORO-2 is designed for seamless integration with RedEye patch applications.

Item:	Bifurcated borosilicate optical fiber assembly couples to sensor probe
Use:	For sensor probes of applicable size and sensitivity
Core diameter:	1000 µm, 600 µm, 300 µm
Length:	2 m or 3 m
Ferrule/jacketing:	Black PVC Monocoil
Reconditioning available:	NA
Options:	BIFBORO-1000-2 BIFBORO-600-2 BIFBORO-300-2 RE-BIFBORO-2 (3.175 mm OD, 2 m length)



Sensor Probe Care and Chemical Compatibility

How to Get the Most Out of Your Oxygen Probe

Our oxygen sensor probes are both robust and simple to maintain. Probe lifetime is typically one year before reconditioning may be necessary, providing that users are careful in handling the probe and ensure that it's not exposed to the excitation source energy for lengthy periods. Some sensor coatings are more appropriate for specific sample environments, so be sure to check the coating compatibility chart on the next page or consult with an Applications Scientist.

Oxygen Sensor Probe Cleaning and Sterilization Guide

Proper maintenance of your oxygen sensor probes may include occasional cleaning and sterilization, which is often required in biological applications. These guidelines apply to probes only and may vary as sensor formulations and other variables change. Please check our website for the most up-to-date information available. Sterilization is a more thorough probe maintenance method than cleaning. Cleaning is useful for removing inclusions, oil and the like, while sterilization refers to any process that eliminates (removes) or kills all forms of life, including transmissible agents that may contaminate the probe.

Cleaning Methods

	FOXY Formulation	FOSPOR Formulation	HIOXY Formulation	Comments
H ₂ O ₂ (hydrogen peroxide at 30%)	Safe	Safe	Safe	FOXY requires single-point recalibration after each cleaning; also, frequent cleaning will shorten FOXY probe lifespan
Isopropanol	Safe	Safe	Safe	FOXY requires single-point recalibration after each cleaning; also, frequent cleaning will shorten FOXY and HIOXY probe lifespan
Ethanol	Safe	Safe	Safe	FOXY requires single-point recalibration after each cleaning; also, frequent cleaning will shorten FOXY probe lifespan
Methanol	Not recommended	Safe	Not recommended	

Note: Brief exposure of probes to these cleaning agents is recommended. Long-term exposure will affect the sensor coating.

Sterilization for Probes

	FOXY	FOSPOR	HIOXY	Comments
Autoclaving	No	No	Yes	HIOXY Probes require single-point reset after autoclaving
Ethylene Oxide	Yes	Yes	Yes	Signal intensity decreases after EtO exposure; recalibration or single-point reset is required
Gamma Radiation	Yes	Not Tested	Not Tested	FOXY Probes require single-point reset after gamma radiation

Sterilization for Patches

RedEye Patches	FOXY	HIOXY	Comments
Ethylene Oxide	Yes	Yes	The signal intensity decreases, reducing the lifespan of the sensor; single-point reset is required
Gamma Radiation	Yes	Not Tested	The signal intensity decreases, reducing the lifespan of the sensor; single-point reset is required

Also available is an autoclavable HIOXY patch (RE-HIOXY-HTC) that uses a BK-7 glass disc as the substrate.

Oxygen Sensor Probe Reconditioning

Good maintenance practices and protection from harsh environments, biofouling, physical abrasion and photobleaching will ensure optimum probe life. If the sensor coating on your oxygen probe is damaged or wears out, recoating services for most of our probe options are available. This reconditioning also includes a recalibration of the probe.

Item codes: FOXY-RECOV, FOSPOR-RECOV and HIOXY-RECOV



Technical Tip

Our oxygen-sensitive RedEye patches are designed primarily for benign gas and liquid environments. The patches are not compatible with chemicals that may attack acrylates and polyester adhesive polymers.

Patches are semi-disposable and do not lend themselves well to cleaning, although some sterilization methods (gamma radiation) may extend their use in biological and other environments. Please consult an Applications Scientist for details.

Sensor Probe Care and Chemical Compatibility

How to Get the Most Out of Your Oxygen Probe

Some chemicals and gases may interfere with oxygen sensor performance by attacking the coating or deteriorating the fluorescence signal. The tables below list observed effects of chemicals and gases on coated test slides and on probes immersed in liquids. Up-to-date compatibility charts are available at our website.

Visual Observation of Sol-Gel Coating on Slides

Probes Without Overcoat in Headspace or Immersed in Chemicals

Chemical	FOXY	HIOXY			Comments	Final Determination	
			FOXY	HIOXY		FOXY	HIOXY
Acetone (Re-agent Plus, ≥ 99%)	No	No	No	No	Lifetime not reproducible	No	No
Acetonitrile	No	Yes	No	No	The lifetime of the probe fluctuates and is not stable in the solution.	No	No
Benzene (99%, A.C.S. reagent)	No	Yes	No	Yes	The probe has a one-time permanent decrease in lifetime when immersed in chemical, therefore it needs to be calibrated in the chemical.	No	Conditionally
Cyclohexane	No	Yes	No	Yes	The HIOXY probe has a one-time permanent decrease in lifetime when immersed in chemical, therefore it needs to be calibrated in the chemical. The FOXY probe decreases both in Signal Level and lifetime.	No	Conditionally
DichloroMethane	No	Yes	No	Yes	The HIOXY probe has a one-time permanent decrease in lifetime when immersed in chemical, therefore it needs to be calibrated in the chemical. The FOXY probe decreases both in Signal Level and lifetime.	No	Conditionally
Heptane	Yes	Yes	Yes	No	FOXY Probe has a one-time permanent decrease in lifetime when immersed in chemical, therefore it needs to be calibrated in the chemical.	Conditionally	No
Hexane (95+%, HPLC grade)	Yes	Yes	No	No	Lifetime not reproducible	No	No
Methanol (98% Histological Grade)	No	Yes	No	Yes	The probe has a one time permanent decrease in lifetime when immersed in chemical, therefore it needs to be calibrated in the chemical.	No	Conditionally
Methyl Methacrylate (99%)	Yes	No	No	No	Lifetime not reproducible	No	No
Styrene (Reagent plus, ≥ 99%)	No	Yes	No	Yes	HIOXY Probe – The probe has a one-time permanent decrease in lifetime when immersed in chemical, therefore it needs to be calibrated in the chemical.	No	Conditionally
Tetrahydrofuran (99+ %)	No	No	No	No	Lifetime not reproducible	No	No
Toluene (99%)	No	No	No	Yes	HIOXY Probe - The probe has a one-time permanent decrease in lifetime when immersed in chemical, therefore it needs to be calibrated and conditioned in the chemical.	No	Conditionally
Xylene (Isomers plus ethyl benzene, reagent plus)	No	Yes	No	No	Lifetime not reproducible	No	No
Ethylene Glycol	Yes	Yes	No	Yes	HIOXY Probe- The probe has a one time permanent decrease in lifetime when immersed in chemical, therefore it needs to be calibrated in the chemical.	No	Conditionally
JP8 (Jet fuel)	No	Yes	No	Yes		No	Yes
Propylene Carbonate	Not tested	Not tested	Not tested	No	Lifetime not reproducible	Not tested	No

Oxygen Sensor Temperature Compensation

Options for Dealing with Temperature Effects in O₂ Measurements

Our optical O₂ sensors are affected by temperature. Temperature affects both fluorescence intensity and excited state lifetime due to the decrease of fluorescence energy quantum efficiency with temperature increase. The effect of change in temperature is seen as a change in the calibration slope.

As temperature increases and partial pressure of oxygen remains the same, compensating for temperature mitigates the risk of a false partial pressure reading. For best results, the sample must be held at a constant temperature ($\pm 1^\circ\text{C}$). The temperature response of our sensors can be determined by the user, or can be supplied by a factory calibration. In a multichannel sensor setup, the user must account for temperature effects in each channel.

In-house Temperature Calibration Services

If your sample cannot be maintained at a constant temperature ($\pm 1^\circ\text{C}$), you can perform a temperature calibration in NeoFox Viewer software or include our temperature calibration service as part of your order. The standard service covers environments from 0-80 $^\circ\text{C}$; extended-range service is available for environments outside those parameters. You'll need to tell us which oxygen sensor formulation you're using (FOXY, FOSPOR or HIOXY) and provide the temperature and oxygen concentration ranges of your sample environment.

Item codes: xxxx (sensor formulation)-CAL (standard option) and xxxx (sensor formulation)-CAL-EXT (extended temperature range)

Temperature Probe Options for Optical Oxygen Sensor Systems

We offer temperature probe options for use with our oxygen sensor systems: a rugged, discrete thermistor or a T1000-style 1/4" (6.35 mm) stainless steel probe with an embedded thermistor. The latter is available in each of three coating formulations (FOXY, FOSPOR, HIOXY).



T1000-TS-6CM-NEO



T1000-TS-NEO



NEOFOX-TP

Temperature Probes for Oxygen Sensor Systems

Item	Description	Core Diameter	Outer Diameter	Length	Ferrule/Jacketing	Pressure Rating	Reconditioning Available
FOXY-T1000-TS-NEO	1/4" process probe w/general-purpose coating and thermistor	1000 μm	6.35 mm	177.8 mm	Stainless steel	3000 psi	Yes
FOXY-T1000-TS-6CM-NEO	1/4" process probe w/general-purpose coating and thermistor	1000 μm	6.35 mm	60 mm	Stainless steel	3000 psi	Yes
FOSPOR-T1000-TS-NEO	1/4" process probe w/high-sensitivity coating and thermistor	1000 μm	6.35 mm	177.8 mm	Stainless steel	3000 psi	Yes
FOSPOR-T1000-TS-6CM-NEO	1/4" process probe w/high-sensitivity coating and thermistor	1000 μm	6.35 mm	60 mm	Stainless steel	3000 psi	Yes
HIOXY-T1000-TS-NEO	1/4" process probe w/hydrocarbon-ready coating and thermistor	1000 μm	6.35 mm	177.8 mm	Stainless steel	3000 psi	Yes
HIOXY-T1000-TS-6CM-NEO	1/4" process probe w/hydrocarbon-ready coating and thermistor	1000 μm	6.35 mm	60 mm	Stainless steel	3000 psi	Yes
NEOFOX-TP	3" x #32 AWG thermistor w/10,000 Ohm resistance @ 25 $^\circ\text{C}$	115 mm	3.5 mm	76.2 mm	Radial lead-wired wires	Not tested	No

RedEye Optical Sensing Patches

Self-adhesive Patches for Non-intrusive Oxygen Measurements

The RedEye® indicator patch measures oxygen non-invasively in sealed packaging and containers used in medical, pharmaceutical and food applications. Using a combination of proprietary sensing material and measuring technologies, this non-invasive patch enables quick determination of the presence of oxygen, as well as quantitative measurements. Oxygen monitoring can also ensure patient safety in point-of-care analysis or indicate a sterile seal on surgical instruments and drug packaging. RedEye patches meet USP Class VI certification for biocompatibility.

RedEye Features a Proprietary Sol Gel Coating

RedEye patches are unique in that high-performance sol gel coatings are used – rather than polymer membranes. RedEye coatings are capable of monitoring low levels of oxygen in gas (to 0.01%) and dissolved oxygen in liquids (to 4 ppb), as well as the higher oxygen levels present in cell culture and respiratory monitoring. Also available is a new design that uses the HIOXY formulation on a BK7 glass substrate autoclavable at 100 °C. Contact an Applications Scientist for details on item RE-HIOXY-HTC.



The RedEye can be integrated into packaging for continuous monitoring or used externally for post-production and R&D monitoring purposes. Depending on the application, the simple presence of oxygen can be visually determined by color change with a handheld LED. A fluorometer can also be used to directly measure oxygen partial pressure.

Typical Applications

- Point-of-care analysis (e.g., disposable oxygen attachments for ventilators used during anesthesia operation)
- Blood bag analysis
- Beverage and food packaging
- Bioprocess control
- Cell culture monitoring

Specifications	FOXY Formulation	FOSPOR Formulation	HIOXY Formulation	HIOXY High-Temp Option
Recommended use:	General purpose coating	High-sensitivity coating for low-oxygen environments	Robust coating for hydrocarbon-rich environments	Applications where autoclaving is necessary
O2% range (at 1 ATM):	0-100%	0-10%	0-20%	0-20.9%
DO range (ppm at 1 ATM):	0-40 ppm	0-4 ppm	0-8 ppm	0-8 ppm
Temperature range:	0 to +60 °C for patches	0 to +60 °C for patches	0 to +60 °C for patches	0 to +100 °C for glass window (patch)
O2% resolution:	0.05% (at 20 s averaging)	0.01% (at 30 s averaging)	0.05% (at 20 s averaging)	0.05% (at 20 s averaging)
DO resolution (at room temp):	20 ppb	4 ppb	20 ppb	4 ppb
O2% accuracy:	5% of reading	5% of reading	5% of reading	<5% of reading
DO accuracy:	5% of reading	5% of reading	5% of reading	<5% of reading
Min. detectable level in gas:	0.1% O2	0.01% O2 (at 30 s averaging)	0.1% O2	0.01%-0.05%
Min. detectable level in water (at room temp):	40 ppb	4 ppb	40 ppb	40 ppb
Response time:	<1 s in gas	30-60 s in gas	<1 s in gas	5-10 s in gas
	~30-45 s with overcoating in gas	~60-90 s with overcoating in gas	~30 s with overcoating in gas	~30 s with overcoating in gas
	~45 s in pure water	~60-90 s in pure water	~30-45 s in pure water	~40-60 s in pure water
Patch material:	Acrylate	Acrylate	Acrylate	BK7 glass
Patch dimensions:	4 mm, 8 mm and 127 mm disk (standard); custom sizes also available	4 mm, 8 mm and 127 mm disk (standard); custom sizes also available	4 mm, 8 mm and 127 mm disk (standard); custom sizes also available	4 mm (standard); custom sizes also available
Standard patch options:	Single patch or pack of 5	Single patch or pack of 5	Single patch or pack of 5	Single glass window
Patch-cuvette options:	Patch applied to quartz or polystyrene cuvettes	Yes	Yes	No
Overcoat option:	Medical-grade overcoat	Medical-grade overcoat	Medical-grade overcoat	Medical-grade overcoat
Adhesive pH compatibility:	Yes (pH 4.0-10.0)	Yes (pH 4.0-10.0)	Yes (pH 4.0-10.0)	Yes (pH 4.0-10.0)

Oxygen Sensor Testing Options and Accessories

Determine the Feasibility of Our Sensors for Your Applications

Sensor Chemical Compatibility Testing

Our optical oxygen sensor probes work well in most environments. But where there is uncertainty about chemical compatibility, users can select from a variety of coated substrates for testing – including free cover slips coated with the formulation of your choice. For more complex testing, consult an Applications Scientist.



Item	Description	Typical Use	Coatings
xxxx (coating formulation)-GF	Coated glass filters; pack of 5	Qualitative and quantitative testing	FOXY, FOSPOR, HIOXY
xxxx (coating formulation)-SGS-M	Spin-coated microscope slide, 1" x 3"	Qualitative and quantitative testing	FOXY, FOSPOR, HIOXY
xxxx (coating formulation)-SGS-Test	Coated cover slips; no charge	Qualitative and quantitative testing	FOXY, FOSPOR, HIOXY

Optical Oxygen Sensing

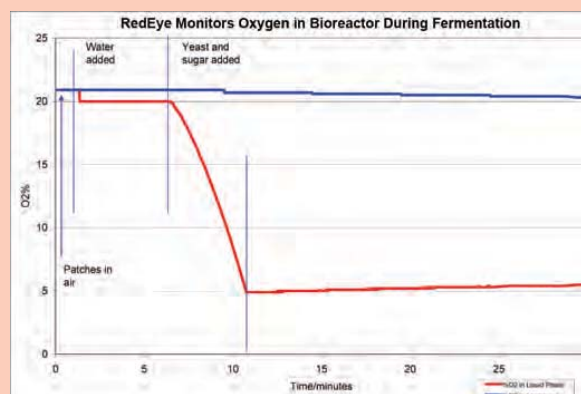
In a recent study we demonstrated the feasibility of our RedEye® oxygen sensing patch in a bioreactor. Oxygen levels in the headspace as well as in liquid phase were monitored non-intrusively during the aerobic and anaerobic process.

Yeasts are a growth form of eukaryotic micro-organisms that are capable of both aerobic and anaerobic respiration. In the presence of oxygen, yeast will consume both oxygen and glucose to produce carbon dioxide and water. In the absence of oxygen, yeast will consume glucose to produce carbon dioxide and ethanol. We investigated the aerobic metabolism of sugar by yeast in order to determine the consumption of oxygen in a closed system.

We used our NeoFox Phase Fluorometer and a bifurcated optical fiber for the excitation and detection of RedEye patches in a lab-scale bioflask. Two RedEye patches were placed inside the flask – one patch in the upper portion to measure oxygen in the vapor phase and one in the lower portion to measure oxygen in the liquid phase. The RedEye patches were calibrated at 0% and 20.9% oxygen in gas. We added 300 mL of water to the flask to a level between the two patches. Oxygen was monitored for a couple of minutes to observe the difference in oxygen between the vapor and liquid phases. We then added 2 g of yeast and 10 g of sugar, sealed the system and monitored the process.

Results

The RedEye patches gave a reading of 20.9% during the first minute of the experiment as they were exposed to air. After we added water, the RedEye patch monitoring the vapor held at 20.9% while the patch in the liquid phase dropped to 20.0% – showing that the water had not yet reached steady-state equilibrium with the ambient conditions. After several minutes the yeast and sugar were added to the flask and the flask was sealed. During the next minutes we observed that the yeast metabolized the sugar and consumed oxygen in the process. By the time the yeast had consumed all of the sugar the oxygen level in the liquid phase dropped from 20.0% to 5.0%. As the oxygen in the vapor phase diffused into the liquid phase, the system began to approach steady-state equilibrium.



USP Class VI Certification

Sensors Division Granted USP Class VI Certification

Ocean Optics has achieved USP Class VI certification for its optical oxygen and pH sensor patches. United States Pharmacopeia (USP) is a standards-setting organization for medicines, healthcare products, food ingredients and related items. Class VI certification relates to the reactivity of plastics in various biological samples and helps to ensure the safety of the sensors for use in biological and pharmaceutical processes, implantable devices, cell cultures, biodegradable bags and more.

Ocean Optics optical O₂ and pH sensors are a convenient alternative to galvanic sensors for real-time, in situ measurements in pharmaceutical and biological processes, biotechnology applications and more. Our proprietary sensor coating materials do not consume the sample and can be applied to substrates such as probes, self-adhesive acrylic patches (the format tested for USP Class VI) and microtiter wells. Coating options are available for general lab use, high-sensitivity applications and hydrocarbon-rich environments.