Fiber Optic Chemical Sensors

Real-Time, In Situ Analyte Monitoring

We've taken our expertise in miniature fiber optic spectroscopy and combined it with advances in materials sciences to develop an innovative line of modular fiber optic chemical sensing solutions.

Ocean Optics designs its sensors by placing a transducer material at the end, or tip, of an optical fiber. These materials change optical properties in response to specific analytes in their immediate environment.

Our transducer materials include both fluorescence-based and absorbance-based indicators. These indicators are immobilized, or trapped, in a variety of proprietary hydrophobic and hydrophilic polymers and sol-gel materials. Materials can be coated on flat substrates such as optical fibers, optical flats, cuvettes and other containers.

Ocean Optics produces components that can be used to monitor oxygen or pH in biological samples, headspace gases, slurries, cosmetics, foods and liquids in natural environments.

Optical Sensors vs. Commercial Electrodes

Fiber Optic Chemical Sensor Systems	Commercial Electrodes
O2 and pH sensors are immune to environmental changes in pH, salinity and ionic strength	Polarographic electrodes can be affected by changes in pH, salinity and ionic strength
O2 and pH sensors are immune to interference from moisture, CO2, methane and other substances	Electrodes are subject to interference from a number of substances and sampling conditions
Sensing materials are easily applied to probes, patches, cuvettes and other media	Electrodes typically are available in probe or cell membrane format only
Sensor coating formulations (especially for O2) are available for a variety of environments	Electrodes often have limited range of chemical compatibility
Optical sensors require less maintenance and are more robust than most electrodes	Electrodes often require tedious maintenance and have a delicate glass body that is prone to breakage
O2 sensors do not consume oxygen, allowing for continuous contact with the sample	O2 electrodes can consume oxygen at rates of ~0.1 micrograms/hour
Calibration is easily handled and can last many months before recalibration is necessary	Electrodes can require recalibration as frequently as hourly
O2 and pH sensors have a long life – up to a year for O2 coatings and 50 uses for pH materials	Electrodes have a typical lifetime of just three months

Sol-Gel Formulation

The Secret to Our Sensor Success

Our propriety sol-gel process produces a silica glass structure at room temperature into which we embed chemically sensitive indicator dyes. We can control matrix pore size to ensure that embedded indicator dyes do not leach out.

We now offer several indicators: ruthenium and Pt-porphyrin for photoluminescent quenching in oxygen applications and an organically modified sol gel (Ormosil) engineered to maximize immunity to ionic strength sensitivity for pH applications. Sol-gel matrices also will accommodate other indicators; contact an Applications Scientist for details.