

OXYGEN Sensors

Carbon Paste Electrode (CPE)



blue box sensors
Selectivity & Sensitivity

The carbon paste oxygen (O_2) sensors have been developed to allow implantation in the brain, thus facilitating long-term *in vivo* and real time measurements of O_2 . The sensors are less prone to surface poisoning and are stable over months for *in vivo* applications. CPEs are commonly used to provide measurements of brain tissue oxygen in freely moving animals and there is good evidence that oxygen levels in brain ECF are related to cerebral blood flow.

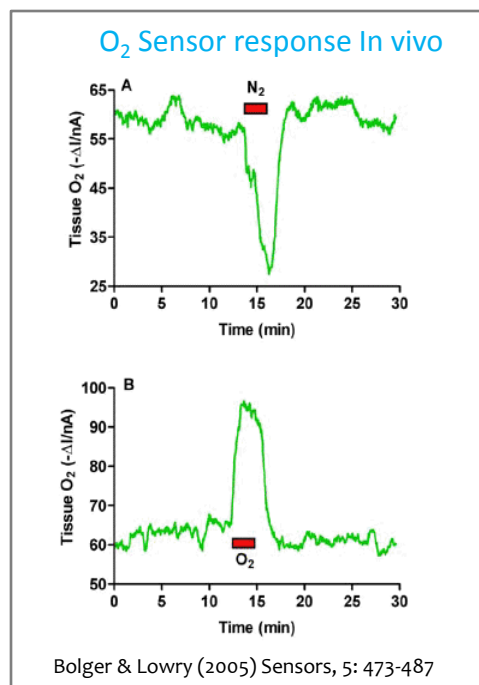


Properties

Oxygen Sensors are based on the electrocatalytic reduction of oxygen at the electrode surface. Measurements are made amperometrically using constant potential amperometry. By applying a constant voltage to the sensor (-650 mV), the resultant measured current is proportional to the dissolved O_2 concentration.

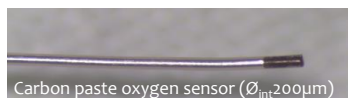
Applications

CPEs can be implanted in any target brain region by stereotaxic implantation and used to assess changes in oxygen current with micro-second resolution.



Dimensions

The dimensions of CPEs are 200 μ m internal diameter and are typically supplied as 3cm or 4cm in length. If you require a different length for your specific purposes, please contact us.



Sensitivity

The electrodes shipped by Blue Box have a sensitivity of approximately -1.5nA/ μ M for dissolved O_2 . Each sensor is calibrated individually encompassing the physiological concentration (50 μ M in brain) and the exact calibration constant is printed on the box the sensor is shipped in.

Response time

The response to changes in oxygen concentration is immediate (response time < 1 sec) and linear between 0 to 1200 μ M.

Life time/Shelf Life

Sensors can be stored at 4°C. The shelf life is half a year from the date of delivery.

www.blueboxsensors.com

In Vivo Stability

The O₂ sensors show stability over long periods of repeated recording. The sensors have been tested to be stable for six months when implanted in the brain. The sensors are single use, that is, after removal from the animal they should not be used again.

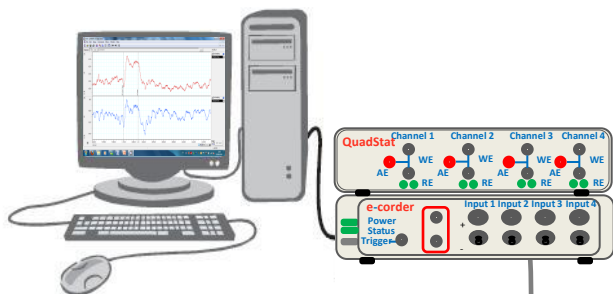
Oxygen Sensor

Internal Diameter	200µm
Applied Potential	-650mV
Shelf life	6-12months
Storage	4°C

Recording Options for In vivo implantations

Oxygen sensors are implanted in any brain region by stereotaxic implantation. They can then either be connected to a potentiostat outside the animal (Tethered) or completely implanted by internal connection to a wireless transmitter which delivers the potential (Telemetry).

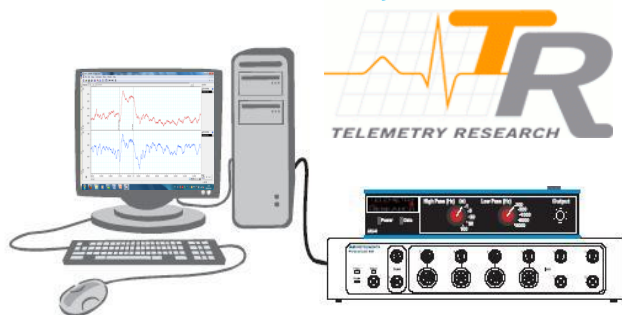
Tethered



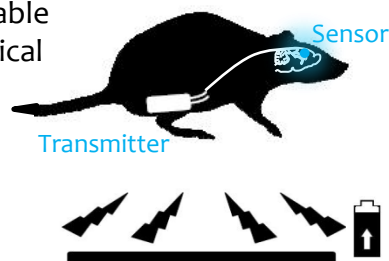
- ❖ Pharmacological testing
- ❖ Operant Box Monitoring
- ❖ General activity sleep/wake



Telemetry



- ❖ Fully implantable
- ❖ Pharmacological testing
- ❖ Behavioural testing
- ❖ In-animal charging



Both tethered and telemetry solutions allow:

- Continuous recording of changes in O₂ concentration in the implanted brain region
- Real time monitoring with sub-second resolution
- Long term stability of signal (≥6months)

Relevant Publications

1. Lowry et al., (2010) *Neuroimage*, 52(2):549-55
2. Bolger & Lowry (2005) *Sensors*, 5: 473-487
3. Lowry et al., (1997) *Journal of Neuroscience Methods*, 71: 177-182