SYSTEMS

Imaging Solutions

VisiSens

Measure and Visualize Oxygen Distributions in 2D For Biological Research

- Non-invasive mapping of metabolic activities
- Imaging of living samples
- Be able to influence experiment conditions during measurement
- USB powered & portable device
- One device instead of thousands of individual sensors

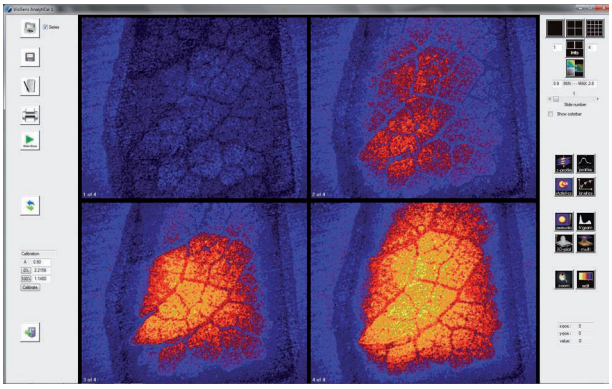
PreSens
PRECISION SENSING

Imaging Solutions

Fluorescent chemical optical sensor foils combined with imaging technology allow easy 2D visualization of oxygen distributions in heterogeneous samples. For measurement the sample surface is covered with the sensor film, which translates the oxygen content into a light signal. The sensor response is recorded pixel by pixel with a digital camera. With VisiSens spatial and temporal changes of oxygen concentration can be monitored.

Features

- Non-invasive mapping of metabolic activity using sensor foils
- Imaging of living samples
- Be able to influence experiment conditions during measurements
- Reliable addressing regions with low or high oxygen content
- More than 100.000 sensing points within one single image
- USB powered & portable
- Easy evaluation via image processing software

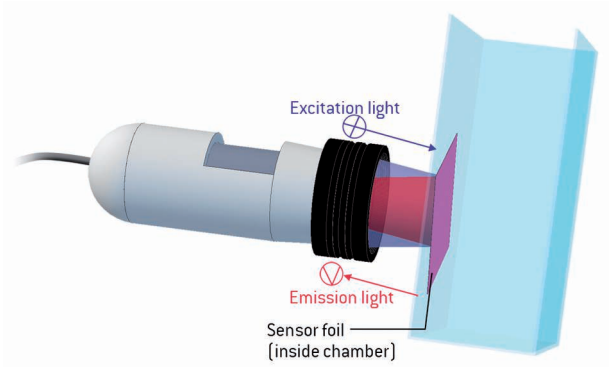


Software

The software allows controlling the image recording process, and assists image processing and evaluation. An easy to use camera controlling user interface manages image acquisition and storage. Measurements which belong together can be organized in user defined sessions as separate folders and annotated with a free text comment. Acquired images can be single images or automatically recorded time series.

Benefits

- Display the sensor response in false color image
- Display the actual pixel information
- Display ROI statistics of user defined polygon ROIs
- Interactive x- and y-axis profiles
- Z-axis profiles for plotting ROI average at defined coordinates
- Follow kinetics through a time series and display as 2D-plot
- Side-by-side image comparison of selected images
- Alpha blending of false color sensor response with color image



The Smart Measurement Method

Fluorescence Ratiometric Imaging (FRIM) is a method for reading out the signal of a fluorescent chemical optical sensor. Ratiometric measuring compensates most of the common interferences, e. g. inhomogeneous lightfields. An optical sensor foil contains an oxygen sensitive dye and a reference dye which are immobilized in an oxygen permeable polymer matrix layer. The indicator dye is emitting red fluorescence which is dynamically quenched by oxygen while the reference dye is giving a constant green light signal. These emissions meet exactly the red and green channel sensitivity of a color RGB chip.

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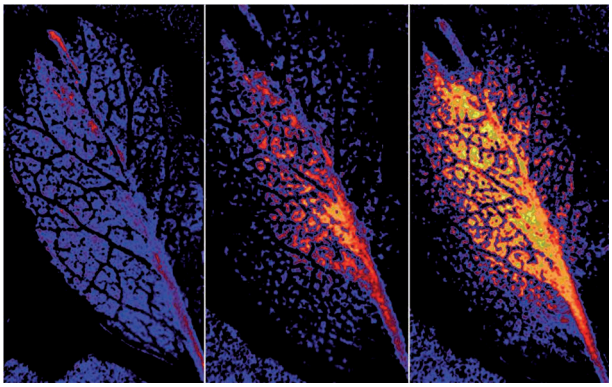
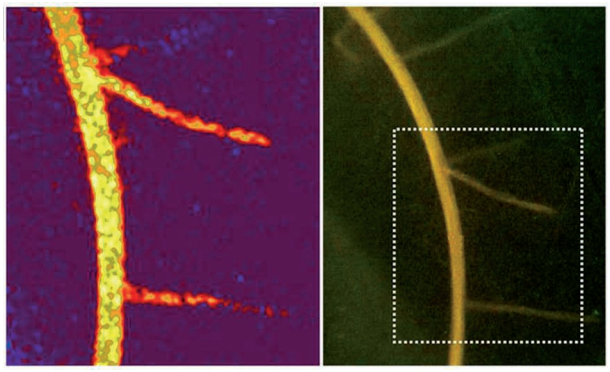


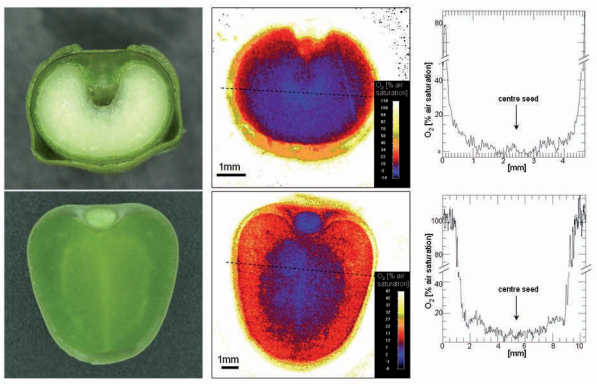
Visualized Respiration in Leaves

Plants are both producers and consumers of oxygen. VisiSens was used to visualize the oxygen levels on the surface of a rose petal during a dark phase, when no oxygen is produced by photosynthesis. The sensor foil attached to the leaf surface sealed it against oxygen from ambient air and translated the oxygen level with high spatial resolution. At the beginning of the dark phase high oxygen concentrations on the leaf surface could be measured (blue), while with continuing dark phase the oxygen concentration decreased (red). Oxygen was consumed by the leaf - the petal was "breathing". VisiSens even allowed investigating different petal structures and compare them in terms of oxygen consumption. Findings in these experiments might give important information relevant for transport and storage of cut flowers.



Oxygen Dynamics in the Rhizosphere of Crop Plants

Research on metabolic activity of plant roots and determining the best cultivation conditions for optimal growth will be of major importance in agriculture, as e. g. water supply and fertilizing could be adjusted for the respective crop plant. 2D imaging with VisiSens was performed to visualize oxygen dynamics between tissue and the surrounding media in the rhizosphere. The respiring root of the crop plant *Brassica napus* was used for experiments carried out inside an incubating chamber to limit oxygen diffusion from the outside. The use of oxygen sensor foils allowed the alignment between the sample structure and the measured oxygen concentration. The acquired color-coded oxygen maps for distinct root regions are quantitative and have a resolution in sub-millimeter range. For the first time oxygen consumption could be spatially resolved and visualized and in this way dynamic changes in oxygen concentration within the complex root system of a plant and its surrounding media could be studied.
Tschiersch et al., Igor Minin (Ed) Microsensors 2011: 281 - 294



Oxygen Distributions in Seeds

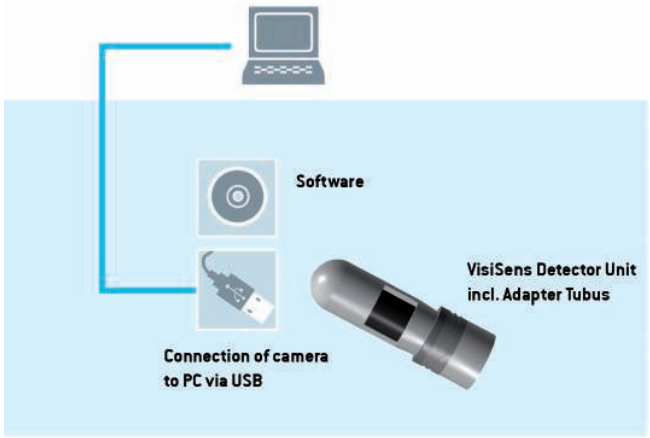
Studying the adjustment of seeds´ metabolism to limited oxygen supply could be relevant for argriculture and biotechnological research. Previous studies on seeds with oxygen microsensors revealed, that oxygen depletion in the seeds´ interior is characteristic for crop plants. Microsensor measurements could only be taken along one dimension (transect), while the oxygen distribution inside the tissue remained unclear. The VisiSens system now allows mapping oxygen distributions over a cross section of the seeds. Pictures taken of barley and pea seed, for example, clearly show lower oxygen levels after 14 minutes of dark incubation. VisiSens provides many advantages in spatial resolution, handling and image processing, that will enhance research on seed metabolism of crop plants.
Rolletschek et al., Scientific Poster 2011

Imaging Solutions

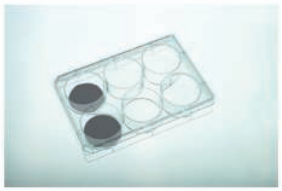
Specifications	Oxygen
Measuring range	0 - 100 % air saturation (0 - 20.9 % O_2)
Response time* (t_{90})	30 sec.
Size of sensor foil*	5 x 5 mm^2 to 40 x 40 mm^2
Number of sensing points within one image*	300,000
Properties	
Temperature range	5 °C to 45 °C
Compatibility	Aqueous solutions, ethanol (max. 10 % V/V), methanol (max. 10 % V/V), pH 2 - 10
Device	
Camera chip	Enhanced Color CMOS
Image Resolution	1.3 megapixel (1280 x 1024 pixels)
Magnification	10-fold up to 220-fold, depending on adapter tubus used
Field of View	~ 2.3 x 2.0 mm^2 to ~ 4.1 x 3.3 cm^2; typically ~ 1.5 x 1.2 cm^2
Output	15 fps live video preview (no storage) and 0.5 fps full-resolution picture storage (.png)
Interface	USB 2.0, high speed USB transmission
Number of LEDs	8
Material	All-aluminum housing
Dimensions	Length 10 cm, diameter 3.8 cm
Weight	170 g (without adapter tubus)

*typical data which may strongly differ with adapting the imaging set-up to specific needs

SET UP



ACCESSORIES



Disposables, e.g.
MicroPlates, with Sensor Foil

Sensor Foils

Technical data can change without prior notice.

Bring to light what's inside. Ask our experts:

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