PRACTICE REPORT
LABORATORY ANALYSIS
ELECTROCHEMISTRY
OXYGEN LDO

ASIS SCIENTIFIC



Determination of oxygen in wine

For more than 2,000 years, winegrowers have been trying to keep the **oxygen content** of their wines as stable and as low as possible. Undesirable **oxidation processes**, which can strongly impair the quality of the wine, should be avoided. The **oxygen concentration in wine** is therefore measured at a number of stages (production, storage, filling). The new **digital LDO technology** makes this determination simpler and more reliable than ever before. The HACH LANGE LDO sensor can measure the oxygen content quickly and simply anywhere.



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Oxygen in wine – easily and reliably monitored with LDO



Fig 1: Modern wine production in stainless steel tanks

"We measure the dissolved oxygen in our wines in order to monitor their chemical stability and as part of our quality control procedures. The oxygen concentration should always be kept below 1 mg/l. We enjoy working with the HQD and the LDO electrode from HACH LANGE, because it is simple to operate and provides precise measured values. Equally important is that the instrument and the electrode require no maintenance, and the instrument functions so reliably. We use the HQD to measure oxygen in wine barrels as well as bottles."

Pecznyik László
Managing Director
Boranal Kft. (Hungary)

Background

"Oxygen is the greatest enemy of wine." (Louis Pasteur)

The quality of a wine is crucially influenced by its oxygen content. Depending on the concentration of dissolved oxygen, oxidation processes may occur, which have a negative effect on the wine:

- ➔ The colour deepens
- ➔ Formation and multiplication of microorganisms
- ➔ Loss of freshness and aroma
- ➔ Rapid ageing

On the other hand, red wine in particular needs a certain amount of oxygen during the maturation process in order to develop. At the latest, more oxygen should be added to young red wine if it has an unpleasant odour (hydrogen sulphide formation) and the tannin structure is dry and unattractive. This usually occurs immediately after fermentation. During the filling stage, however, no more oxygen should be added.

Significance of oxygen analysis

Whatever the circumstances, an exact knowledge of the oxygen concentration in wine is of immense significance. Especially as the dosage and consumption of sulphurous acid (preservatives and antioxidant) depends mainly on the amount of dissolved oxygen. Determining oxygen before the filling stage therefore simplifies the correct sulphur dioxide dosage. Ideally the filling stage should be reached with 0.2–0.5 mg/l dissolved oxygen.

Oxygen measurement with LDO

With HQD digital electrochemical meters, it is now possible to monitor the oxygen content of wine the widely different measurement locations with one and the same instrument. In the barrel, the tank, or the bottle (see Figs. 3 and 4). The maintenance-free LDO oxygen electrode from HACH LANGE yields exact measurement results in just a few seconds. Thanks to the new LDO technology, the substances in the wine have no influence on the value. It makes no difference whether the measurement is carried out in red, rose or white wine, or whether turbidities are present.
Up to 500 measured values can be stored in the HQD and/or simply printed or transferred to a PC.
Incidentally, the HQD can also determine pH and conductivity if it is provided with the corresponding electrodes.

Simple data transmission to printer or computer



Simple, intuitive operation

Automatic storage of measured values, including sample and user IDs

Fig. 2: The HQD



Figs. 3 und 4: Oxygen measurement in a bottle with HQD and LDO sensor



Important tip for LDO determination in a wine bottle:
During the measurement, the probe should be moved a few times (simply but carefully allow it to "fall" onto the bottle neck). This prevents air bubbles from collecting on the measuring sensor and influencing the result.

Robust outdoor electrodes with long cables

The HQD offers a special highlight: the determination of LDO on site (e.g. in the barrel or tank). Besides the usual standard electrode, a rugged outdoor electrode is available with a cable length of up to 30 m. The watertight probe in a steel housing is impact resistant and can be immersed in a medium some distance away without any difficulty.



Fig. 5: Rugged LDO outdoor sensors with cables 5, 10, 15 or 30 m long

Conclusion

The ability to monitor intended and unintended oxygen input during wine making, storage and filling has many advantages:

- ➔ Greater stability of white and rose wines
- ➔ Complete and successful fermentation process
- ➔ Stabilisation of the colour and structure of red wines
- ➔ Control of the "aroma profile" of white and rose wines
- ➔ Reduction of the amount of antioxidant (sulphurous acid)
- ➔ Customers receive wine with an optimal sensory make-up
- ➔ Avoidance of complaints



HQD LDO: From water to wine
At the Juris vineyard in Gols (Austria), a new method for the quality control of wine is being tested. The method makes use of portable HQD instruments and LDO oxygen probes.

Axel Stiegelmar of the Juris vineyard explains:
"The LDO oxygen measurement with HQD instruments gives an insight into the health of the wine at the various stages of production. We can observe the oxygen uptake over time while the wine is stored in the barrique barrels, and we can therefore intervene when necessary. Overall, this has brought about an improvement in hygiene and tannin management. The quality of the wine is therefore enhanced."

Technical data

Technical data (extract)

	HQ30D flexi	HQ40D multi
Measurement channels	1 (pH, conductivity, O_2)	2 (pH, conductivity, O_2)
Oxygen (LDO)	●	●
Measuring range	0.00–20.0 mg/l; 0–200 %	
Resolution (selectable)	0.01 or 0.1 mg/l; 0.1 % saturation	
Accuracy	±1 % of the measuring range	
Air pressure compensation	Automatic	Automatic
Other characteristics	Automatic correction of salinity; choice of language; different measuring methods can be used (manual, interval, continuous); watertight to IP67; cable lengths 1–30 m; usable in the laboratory and on site	
Special features of LDO	No calibration needed; maintenance-free; drift-free measured values; no polarisation; suitable for oxygen measurement in red, rose and white wines.	
Conductivity	●	●
Measuring range	0.01 µS/cm – 200 mS/cm	0.01 µS/cm – 200 mS/cm
Resolution	Max. 5 places, 2 decimal places, if possible	
Accuracy	±0,5 % (1 µS/cm – 200 mS/cm)	
Temperature compensation	Non-linear (natural water in accordance with DIN 38404 and EN ISO 7888), non-linear (NaCl), linear coefficient [numeric value] %/°C, no compensation	
pH	●	●
Measuring range	0–14	0–14
Resolution	0.1 / 0.01 / 0.001	0.1 / 0.01 / 0.001
Accuracy	±0.002	±0.002
Temperature compensation	Automatic	Automatic



Fig. 7: HQ30D with standard and rugged outdoor electrodes

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Contact us to place an order, request information or receive technical support.

On site technical support.

Quality assurance, complete with standard solutions, instrument checks and test solutions.

www.hach-lange.com
Up to date and secure, with downloads, information and e-shop.

Assurance of legal compliance, together with environmental protection via collection service for recycling of used reagents.

Literature

- Oenodev “Oxigeno & Vino - Apuntes de Enología” [www.az3oeno.com]
- Deutsche Landwirtschafts-Gesellschaft e. V.: www.wein.de
- Berhard Fiedlers We(in)blog: www.bernhard-fiedler.at/weblog
- HACH LANGE Praxisbericht “pH-Wert, Leitfähigkeit, Sauerstoff - Das HQD-System im Einsatz”, December 2007



Fig. 6: Wine cellar
Source: Weingut Juris – Axel Stiegelmar

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