



Application Note AN-I-027

# Dissolved oxygen in fruit juices

## Fast and accurate determination using an optical sensor

Dissolved oxygen (DO), incorporated into juices during processing, affects quality parameters of the beverage during storage such as Vitamin C concentration, color, and aroma. Vitamin C (ascorbic acid) is irreversibly oxidized to dehydroascorbic acid in the presence of oxygen. The speed of degradation depends on temperature, exposure to light, and pH value. Aside from the destruction of vitamins and other antioxidants by oxygen, a browning of the juice is a further possibility.

Various oxygen removal methods are used during juice production, such as vacuum-deaeration (vacuum on product to release dissolved oxygen) or gas

sparging (replacing  $O_2$  with another gas, such as  $N_2$ ) to increase product quality and extend shelf life. However, these methods have the drawback that the aroma might be affected since the volatile compounds are also removed. In some cases, oxygen scavengers are incorporated into the packaging material.

By assessing the content of dissolved oxygen in fruit juices, manufacturers can improve the overall product quality. This application note describes a fast and accurate determination of dissolved oxygen in juices by using an optical sensor.

## SAMPLE AND SAMPLE PREPARATION

The method is demonstrated on apple juice and multivitamin juice. Shake the sealed sample well

before analysis. No further sample preparation is required.

## EXPERIMENTAL

This analysis is carried out on a 914 pH/DO/Conductometer equipped with an O<sub>2</sub>-Lumitrode which is calibrated with 100% and 0% air saturation.

The prepared sample is carefully opened and the O<sub>2</sub>-Lumitrode is placed directly into the sample. The measurement is started, and the DO content is measured until a stable value is reached. Afterwards, the sensor is removed and rinsed well with deionized water. If necessary, blot dry. For each analysis, a new sample bottle is opened. The sensor is stored dry with mounted calibration vessel for protection.



**Figure 1.** 914 pH/DO/Conductometer equipped with an O<sub>2</sub>-Lumitrode for the determination of dissolved oxygen in juices.

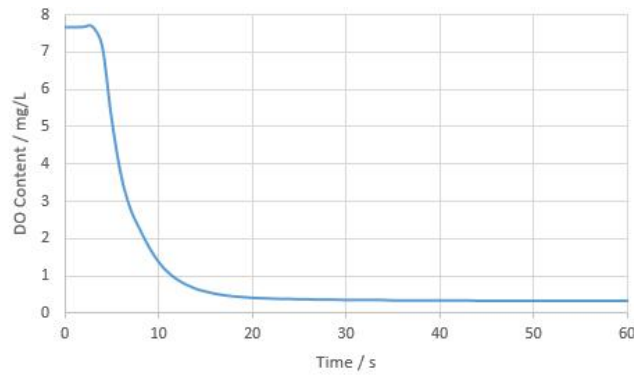
## RESULTS

For each analysis, stable results are obtained within approximately 20 seconds. The calculated absolute

standard deviation is smaller than 0.1 mg/L.

**Table 1.** Content of dissolved oxygen (mg/L) in apple juice and multi vitamin juice (n = 3).

	Mean DO content in mg/L	SD(abs) mg/L	SD(rel) %
Apple Juice	1.04	0.09	8.3
Multivitamin juice	0.28	0.03	9.4



**Figure 2.** Example measurement curve of the DO content in multivitamin juice.

## CONCLUSION

The dissolved oxygen content in juices can be assessed reliably and quickly using a 914 pH/DO Conductometer equipped with the optical sensor O<sub>2</sub>-Lumitrode. An accurate measurement takes less than

30 seconds and the sensor is completely maintenance-free. No need to worry about the quality of your sensor: if the O<sub>2</sub> cap needs to be replaced, the instrument will inform you.

Internal reference: AW ISE CH2-0174-0012020

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## CONFIGURATION



### 914 pH/DO/Conductometer Laborvariante

Tragbares Zweikanal-pH/DO/Leitfähigkeitsmessgerät mit intelligentem Messeingang zur Messung von gelösten Sauerstoff/pH/mV/ und analogem Messeingang für Leitfähigkeit/TDS/Salinität und Temperatur.

Mit diesem batteriebetriebenen Messgerät mit Stativkonsole sind Sie für Messungen im Feld und im Labor bestens gerüstet.

- Digitaler Messeingang für die O<sub>2</sub>-Lumitrode oder die intelligenten pH-Elektroden
- Analoger Leitfähigkeitsmesseingang für die 4-Leiter-Leitfähigkeitsmesszellen
- Labor-pH/DO und Leitfähigkeitsmessgerät mit eingebautem Batteriepack
- Parallele Messung von pH-Wert und Leitfähigkeit
- Parallele Messung von Sauerstoff und Leitfähigkeit
- Robustes, wasser- und staubdichtes Gehäuse (IP67) für den harten Außen- und Laboreinsatz
- LCD-Farbdisplay mit Hintergrundbeleuchtung für einfache Ablesbarkeit der Ergebnisse
- USB-Schnittstelle für einfachen Datenexport auf PC oder Drucker
- Großer interner Speicher (10'000 Datensätze)
- Pin-geschützter Benutzer- und Expertenmodus, verhindert ungewollte Parameteränderungen
- GLP-konformer Ausdruck und Datenexport mit User-ID und Zeitstempel



### O<sub>2</sub>-Lumitrode

Der optische Sensor für die Messung von gelöstem Sauerstoff (DO) kann mit einem 913 pH/DO Meter oder 914 pH/DO Konduktometer verwendet werden. Das Messprinzip des Sensors beruht auf der Lumineszenzlöschung. Der platzsparende und wartungsfreie Sensor ist z.B. geeignet für die DO Messung in der:

- Qualitätskontrolle von Wasser
- Abwasserindustrie
- Getränkeherstellung
- Fischzucht

Der Sensor wird mit einem Kalibrierköcher ausgeliefert.

Die Messkappe (O<sub>2</sub>-Kappe), welche das sauerstoffsensitive Luminophor enthält, kann bei Bedarf einfach ausgetauscht werden.