

Measuring pH in wine and juice

Water Analysis Instruments, Thermo Fisher Scientific

Key Words

pH, red wine, wine-making, juice, proteins, sulfides, tannins, polyphenols.

Goal

The following application note includes the recommended equipment, procedures and maintenance for accurate pH readings.

Introduction

Since pH plays a critical role in wine making, measurements are taken throughout the winemaking process, from juice to finished wine. Typical pH levels in wine range from 2.9 to 3.9. Various components of juice and wine can challenge the performance of the pH electrode, including proteins, sulfides, tannins, and polyphenols. This note includes recommended equipment, procedures, and maintenance to assure accurate pH readings.

Recommended Equipment

- Thermo Scientific™ Orion™ pH meter (Star A211, VERSA STAR, or equivalent)
- Thermo Scientific™ Orion™ ROSS™ Sure-Flow™ pH Electrode (Cat. No. 8172BNWP), Orion Green pH Combination Electrode (Cat. No. GD9156BNWP), or equivalent
- Automatic Temperature Compensation (ATC) probe (Cat. No. 927007MD)
- Stirrer (Cat. No. 096019)
- Swing arm and electrode holder (Cat. No. 090043)
- pH electrode storage bottle (Cat. No. 910003)

Recommended Solutions

- pH 4.01 and 7.00 buffers (Cat. No. 910104, 910107)
- Electrode filling solution (Cat. No. 810007 for 8172BNWP, or Cat. No. 910008-WA for GD9156BNWP)
- Orion ROSS storage solution (Cat. No. 810001) or pH electrode storage solution (Cat. No. 910001)
- Deionized water (DI)
- pH electrode cleaning solution A (Cat. No. 900021-WA)
- pH electrode cleaning solution D (Cat. No. 900024)
- ~75% alcohol solution (methanol or ethanol in water).



Meter Setup

Connect the pH electrode, ATC probe, and stirrer to the meter. Set measurement mode to pH. In Setup, set the stirrer speed to 3, pH resolution to 0.01, buffer set to USA and read type to auto or continuous.

Note: When the ATC is connected properly, the true temperature (not the reference 25.0) will be displayed on the screen. The ATC will measure buffer and sample temperatures and will ensure precise automatic temperature-compensated readings.

Electrode Calibration

Before sample testing, perform a two-point pH calibration using pH 4.01 and 7.00 buffers. (*See Analysis instructions below for details on test protocol*). The electrode slope should be between 92 and 102%.

Sample Preparation

Place about 50 mL of sample in a small, clean beaker (about 100 mL size).

Analysis

Place the pH electrode, ATC, and stirrer into the electrode stand. Rinse each with DI water. Place probes and stirrer into the sample, immersing about 1-2 inches into the solution. Stir the sample continuously. When the meter indicates the reading is stable, record the pH to two decimal places (e.g., 3.39) and the temperature to one decimal place. (If using Autoread mode, the meter will lock on the final reading and automatically log the readings, when the log function is turned on in Setup). Between readings, rinse the probes and stirrer with DI water to remove any remaining sample.

Electrode Storage

After testing is complete, rinse pH electrode thoroughly with the ~75% alcohol solution or immerse for 5 minutes, then rinse thoroughly with DI water. Cover the fill hole and store pH electrode in a bottle of electrode storage solution. Change the storage solution biweekly or monthly. ATC should be stored dry.

Electrode Maintenance

Fill the electrode to the level of the fill hole each day, prior to testing. Weekly or biweekly, empty the fill solution and replace with fresh fill solution.

Electrode Cleaning

If the electrode begins to exhibit drift and/or is slow to respond, clean it as follows: Clean the electrode with Orion Cleaning Solution A according to the instructions, to remove proteins and restore the pH membrane. If further cleaning is desired, use Orion Cleaning solution D to remove organic compounds and restore the pH membrane.

Quality Control (QC)

Recommended QC procedures may include: calibration, calibration verification, sample duplicates, and/or QC samples.

Results of Measuring the pH of Red Wine

Precision	8172BNWP	GD9156BNWP
pH of Red Wine, avg. (n = 10)	3.41	3.42
Std .Dev.	0.02	0.01
Avg. Temp. (°C)	21.9	21.9
Avg. Response Time	< 30 sec	< 30 sec
Accuracy	8172BNWP	GD9156BNWP
pH 4 Buffer, avg. (n = 6)	4.01	4.01
Difference From Expected	0.00	0.00
Std .Dev.	0.01	0.01

Precision: Both Orion pH electrodes demonstrated excellent precision between test results for multiple replicates of wine and pH buffer as follows:

- Red wine - showing a standard deviation of <0.02 pH units
- pH 4 buffer - showing a standard deviation of 0.01 pH units.

Accuracy: Both Orion pH electrodes demonstrated excellent accuracy for multiple replicates of pH 4 buffer, showing a difference from expected value of 0.00 pH units (reads exactly as expected).

Speed: Both Orion pH electrodes demonstrated excellent response time. The time to a stable reading averaged less than 30 seconds for wine samples and pH 4 buffer.

References

Zoecklein et al. *Wine Analysis and Production*. Chapman and Hall. 1995.

AOAC International. *AOAC Official Method 960.19, pH of Wines*. Official Methods of Analysis (OMA), 16th edition. 1999. www.aoac.org

To purchase Thermo Scientific Orion pH meters, electrodes and other related products, please contact your local equipment distributor and reference the part numbers listed below:

Product	Description	Part Number
Electrodes	Thermo Scientific Orion ROSS Sure-Flow pH Electrode	8172BNWP
	Thermo Scientific Orion Green pH Electrode	GD9156BNWP
Meters	Thermo Scientific Orion Star A211 pH Benchtop Meter	STARA2115
	Thermo Scientific Orion VERSA STAR pH Benchtop Meter	VSTAR12
Solutions	Thermo Scientific Orion pH 4.01 and 7.00 Buffers	910104 and 910107
	Thermo Scientific Orion Filling Solution for 8172BNWP or GD9156BNWP pH Electrodes	810007 or 910008-WA
	Thermo Scientific Orion ROSS Storage Solution or pH Electrode Storage Solution	810001 or 910001
	Thermo Scientific Orion pH Electrode Cleaning Solution A	900021-WA
	Thermo Scientific Orion pH Electrode Cleaning Solution D	900024

thermoscientific.com/water

© 2014 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific and its subsidiaries.

Water Analysis Instruments

North America

Toll Free: 1-800-225-1480
Tel: 1-978-232-6000
info.water@thermo.com

Netherlands

Tel: (31) 020-4936270
info.water.uk@thermo.com

China

Tel: (86) 21-68654588
wai.asia@thermofisher.com

India

Tel: (91) 22-4157-8800
wai.asia@thermofisher.com

Singapore

Tel: (65) 6778-6876
wai.asia@thermofisher.com

Japan

Tel: (81) 045-453-9175
wai.asia@thermofisher.com

Australia

Tel: (613) 9757-4300
in Australia (1300) 735-295
InfoWaterAU@thermofisher.com

Thermo
SCIENTIFIC

A Thermo Fisher Scientific Brand