

Measuring pH in Soil

Water Analysis Instruments, Thermo Fisher Scientific

Key Words

pH, soil, alkalinity, acidity strength, agriculture, environmental testing.

Goal

This application note explains how to measure the pH (alkalinity) of soil using a Thermo Scientific™ Orion™ ROSS™ Sure-Flow™ combination pH electrode.



Introduction

The pH of soil indicates its alkalinity or acidity strength. This measurement is important for determining which plants or crops would thrive the most in the soil. This measurement can be made by suspending soil in water and measuring the pH with an epoxy body pH electrode. In this application note, we used a Thermo Scientific Orion ROSS Sure-Flow combination pH electrode with an epoxy-body, which is designed to measure pH in soil and other difficult samples.

Equipment

- Thermo Scientific™ Orion Star™ A211 pH benchtop meter kit (Cat. No. STARA2119), which includes an Orion 9165BNWP ROSS Sure-Flow pH electrode, an Orion 927007MD ATC temperature probe, a meter-attachable electrode stand, pH 4/7/10 buffers and standard storage solution
- Orion automatic stirrer probe (Cat. No. 096019)

Solutions

- Orion pH electrode fill solution (Cat. No. 900011)
- Deionized water (DI)

Solutions Preparation

None required.

Meter Setup

Connect the pH electrode, stirrer and ATC probe to the Orion Star A211 pH meter. Set measurement mode to pH. In the meter setup mode, set resolution to 0.01, Buffer Set to USA and read type to continuous. If all steps were followed correctly the meter display will show units as “pH” and a value with two decimal places. The temperature will also be displayed on the screen.

Electrode Setup

See the electrode manual for preparation of the electrode.

Electrode Performance Check

Check slope at least daily according to the electrode manual. Drift may be checked by comparing a 1-minute to 2-minute reading. Results should agree with desired criteria. See troubleshooting section of manual if slope and/or drift are not acceptable.

Electrode Storage, Soaking, and Rinsing

See electrode manual for storage:

1. Between measurements
2. Overnight, and
3. For long periods of time.

Between measurements, rinse the electrode with DI water and blot dry with lint free tissue before measuring the next sample.

Sample Preservation

None required.

Sample Preparation

Weigh 20g of soil into a beaker. Using a graduated cylinder, add 20mL of deionized water to the soil, mix for a 30 minute period and let stand for 1 hour. For precise measurements, allow all the standards and the samples to reach the same temperature before analysis.

Calibration

Perform a two point calibration using pH 7.00 and 10.01 buffers as these bracket the expected sample pH. The electrode slope should be between 92 and 102%. Read a fresh portion of buffers to verify calibration. If readings are not acceptable and/or slope is not within range, see the troubleshooting section of your manual.

Analysis

Rinse electrode, ATC probe and stirrer with DI water and blot dry. Place all probes in sample and measure. The pH value will be displayed. When a stable reading is achieved, the screen will stop flashing and the “ready” message will appear.

To purchase Thermo Scientific laboratory products, please contact your local equipment distributor and reference the part numbers listed below:

Product	Description	Part Number
Meters	Thermo Scientific Orion Star A211 pH benchtop meter kit, which includes an Orion 9165BNWP Sure-Flow epoxy-body pH electrode, an Orion 927007MD stainless steel ATC probe, an Orion 910199 pH buffer and solution kit and electrode stand	STARA2119
Electrodes	Thermo Scientific Orion Sure-Flow combination pH electrode	9165BNWP
	Thermo Scientific Orion ATC probe	927007MD
Solutions	Thermo Scientific Orion pH electrode filling solution	900011
	Thermo Scientific Orion ROSS pH electrode storage solution	810001
	Thermo Scientific Orion pH 4.01, 7.00, and 10.01 buffers	910104, 910107 and 910110
Accessories	Thermo Scientific Orion automatic stirrer probe	096019
	Thermo Scientific Orion swing arm electrode stand	090043
	Thermo Scientific Nalgene Griffin polypropylene low-form beaker, 30mL	1201-0030
	Thermo Scientific Nalgene polypropylene graduated cylinder, 25mL	3662-0025
Deionized Water	Thermo Scientific Barnstead water purification system	Multiple

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

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wai.asia@thermofisher.com

China

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

Singapore

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

Australia

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

Comments

The pH of soil samples can vary greatly depending on the source of the soil. If the pH of the first sample measured is not in the 7.00-10.01 range, it is recommended to recalibrate the electrode using buffers which will bracket the sample pH.

Quality Control (QC)

Recommended QC procedures include: calibration and calibration verification, sample duplicates, slope, drift and lab control sample.

Results

Soil Sample	pH
Sample 1	7.96
Sample 2	7.94
Sample 3	7.91
Sample 4	7.98
Sample 5	7.92
Mean	7.94
Standard Deviation	0.03

Result Statistics

# Trials	Average	SD
5	7.94	± 0.03 pH units

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