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COLE-PARMER
AMMONIUM, NITRATE, CALCIUM, WATER HARDNESS, POTASSIUM, PERCHLORATE ELECTRODE
QUICK START INSTRUCTION

Required Equipment & Solutions

1. An Ion Meter.
2. Deionized or distilled water for standard preparation.
3. ISE Electrode (supplied in electrode box).
4. Reference Filling Solution (30ml supplied in electrode box).
5. Standard 1000ppm.
6. Ionic Strength Adjuster (ISA) Solution.
7. Pipet for preparing standards and samples.

Ion	Laboratory Glass Electrode	Economy Epoxy Electrode	ISA Solution 475 ml	1000 PPM Standard 475 ml	Reference Fill Solution / 125 ml
Ammonium	K-27502-03	K-27504-00	K-27503-53	K-27502-53	0.1M NaCl
Calcium Ca^{2+}	K-27502-09	K-27504-06	K-27503-52	K-27502-59	4M KCl
Nitrate NO_3^-	K-27502-31	K-27504-22	K-27503-60	K-27502-79	0.1M $(NH_4)_2$ SO4
Perchlorate ClO_4^-	K-27502-35	K-27504-24	K-27503-60	K-27502-85	0.1M $(NH_4)_2$ SO4
Potassium K^+	K-27502-39	K-27504-26	K-27503-53	K-27502-89	0.1M NaCl
Water Hardness	K-27502-49	K-27504-34	K-27503-52	k-27502-99	4M KCl

Electrode Preparation

Remove the small black shipping cap from the bottom of the electrode and remove the rubber insert covering the filling hole of the reference chamber. Fill the electrode with the reference filling solution shipped with the electrode. Gently shake the electrode downward in the same manner as a clinical thermometer to remove any air bubbles which might be trapped behind the membrane. Prior to first usage, or after long-term storage, immerse the electrode in deionized water for thirty minutes. The electrode is now ready for use.

Measurement using an Ion Meter (in the Concentration mode)

1. By serial dilution of the 1000 ppm standard, prepare two standards whose concentration is near the expected sample concentration. For example, to make a 100 ppm standard, pipet 10ml of the 1000 ppm standard into a 100ml volumetric flask and dilute to volume with deionized water. Next to make a 10 ppm standard, pipet 10ml of the newly-made 100 ppm standard into a 100ml volumetric flask and dilute to volume with deionized water. A 1 ppm standard is made by further dilution of the 10 ppm standard. Measure out 100ml of each standard into individual 150ml beakers.
2. Lower the electrode tip into the more dilute solution. Begin stirring at a constant rate. Add 2ml of ISA to the solution and continue stirring.
3. After 1 minute, fix the value in the memory according to the meter manufacturer's calibration instructions.
4. Rinse the electrode tip with distilled water and blot dry.
5. Lower the electrode tip into the more concentrated solution. Begin stirring at a constant rate. Add 2ml of ISA to the solution and continue stirring.

6. After 1 minute, fix the value in the memory according to the meter manufacturer's calibration instructions.
7. Add 100 ml of the sample and 2 ml of ISA into a 150 ml beaker. Lower the electrode tip into the solution. Begin stirring at a constant rate.
8. After 1 minute, read the concentration directly from the meter display.
9. The electrode should be re-calibrated every 1-2 hours. Simply repeat Steps 2-7 above.

Measuring Hints

1. The sensing membrane is normally subject to water uptake and might appear milky or white. This has no effect on performance.
2. All samples and standards should be at the same temperature for precise measurement, preferably 25°C. Temperature should be less than 50°C.
3. Constant, but not violent, stirring is necessary for accurate measurement.
4. Always rinse the electrode tip with distilled water and blot dry with a fresh tissue between readings to prevent solution carryover. Do not wipe or rub the sensing membrane.
5. Check the electrode for air bubbles adhering to the membrane surface after immersion in solution. Agitate the electrode gently to remove the air bubbles.
6. A slow or sluggish electrode response may indicate surface contamination of the membrane. Soak the electrode tip in distilled water for about 5 minutes to clean the membrane. Rinse the membrane and soak in dilute standard solution for about 5 minutes to restore performance.
7. Use fresh standards for calibration.
8. Re-calibrate every few hours for routine measurement.
9. All samples and standards must be aqueous. They must not contain organic solvents.

Interferences

Electrode drift and slow response could indicate the presence of interferences. Soak the electrode in distilled water for five minutes, then soak for five minutes in 100 ppm standard solution to restore proper response. See **SPECIFICATIONS**.

Temperature Influences

Samples and standards should be at the same temperature, since electrode readings are influenced by changes in temperature. The electrodes can be used at temperatures from 0° - 50°C. Room temperature measurements are recommended, since measurements at temperatures quite different from room temperature may require equilibrium times up to one hour.

Electrode Response

The electrode response time, varies from one minute above 10 ppm to several minutes below 10 ppm.

pH Effects

The electrode has a specific pH range. Use at other pH values can adversely affect the membrane. See **SPECIFICATIONS.**

Electrode Life

The electrode should last six months in normal laboratory use. On-line measurement might shorten operational lifetime to a few months. In time, the response time will lengthen and the calibration slope will decrease to the point calibration is difficult and electrode replacement is required.

Electrode Storage

The electrode may be stored in 10 ppm standard for short periods of time. For storage more than two weeks, rinse and dry the membrane and cover the tip with the protective cap shipped with the electrode. The reference portion of the combination electrode should be drained of filling solution, and the rubber insert should be placed over the filling hole.

TROUBLESHOOTING

Remember to remove the black protective shipping cap on the bottom of the electrode and expose the refill hole underneath the electrode cap. Fill the electrode with the Reference Filling Solution shipped with the electrode to a level just below the fill hole.

Out of Range Reading

- Defective meter .....Check meter with shorting strap (see meter instruction manual)
- Electrode not plugged in properly .....Unplug electrode and reseat
- Reference chamber not filled .....Fill reference chamber to level just below the fill hole
- Air bubbles on membrane .....Remove air bubble by re-dipping electrode

Low Slope or No Slope

- Standards contaminated or incorrectly made .....Prepare fresh standards
- Air bubble on membrane .....Remove air bubble by re-dipping electrode
- Electrode exposed to interferences .....Soak electrode in deionized water for 5 minutes and repeat calibration
- Defective electrode .....Change to new electrode

Drift (reading changing in one direction)

- Samples and standards at different temperatures .....Allow sample and standards to come to the same temperature before measurement
- Electrode exposed to interferences .....Soak electrode in deionized water for 5 minutes and repeat calibration
- Incorrect pH .....Adjust pH to correct operating pH range for the electrode

Noisy or Unstable Readings (readings randomly changing)

- Defective meter .....Check meter with shorting strap (see meter instruction manual)
- Air bubble on membrane .....Remove air bubble by re-dipping electrode
- Meter or stirrer not grounded .....Ground meter or stirrer
- Electrode exposed to interferences .....Soak electrode in deionized water for 5 minutes and repeat calibration
- Defective electrode .....Change to new electrode

SPECIFICATIONS

Ion	Concentration Range (mol/L)	Concentration Range (ppm)	Interferences	pH Range	Slope (mV) 10-100ppm
Ammonium NH_4^+	5 x 10^{-6} to 1 M	0.1 to 18,000	K^+	4 to 10	52 - 59
Calcium Ca^{2+}	5 x 10^{-6} to 1 M	0.2 to 40,000	Pb^{2+}, Hg^{2+}, Cu^{2+}, Ni^{2+}	3 to 10	24 - 29
Nitrate NO_3^-	7 x 10^{-6} to 1 M	0.5 to 62,000	ClO_4^-, I^-, CN^-, BF_4^-, Cl^-, NO_2^-	2.5 to 11	52 - 59
Perchlorate ClO_4^-	7 x 10^{-6} to 1 M	0.7 to 98,000	---	2.5 to 11	52 - 59
Potassium K^+	1 x 10^{-6} to 1 M	0.04 to 39,000	NH_4^+, Cs^+	2 to 12	52 - 59
Fluoroborate BF_4^-	7 x 10^{-6} to 1 M	0.1 to 10,800	ClO_4^-, I^-, CN^-	2.5 to 11	52 - 59
Water Hardness	1 x 10^{-5} to 1 M	0.4 to 40,000	Zn^{2+}, Cu^{2+}, Ni^{2+}, Fe^{2+}	5 to 10	24 - 29