Cole-Parmer®

Delivering Solutions You Trust™

BROMIDE · CADMIUM · CHLORIDE · COPPER
SULFIDE · CYANIDE · IODIDE · LEAD · SILVER

ION SELECTIVE ELECTRODES (ISE)

COLE-PARMER
BROMIDE, CADMIUM, CHLORIDE, COPPER, SULFIDE, CYANIDE, IODIDE, LEAD, SILVER
QUICK START INSTRUCTIONS

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. Pipets 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
Bromide Br^-	K-27502-05	K-27504-02	K-27503-51	K-27502-55	1M KNO_3
Cadmium Cd^{2+}	K-27502-07	K-27504-04	K-27503-51	1000 ppm Cd^{2+}	1M KNO_3
Chloride Cl^-	K-27502-13	K-27504-08	K-27503-51	K-27502-63	1M KNO_3
Copper Cu^{2+}	K-27502-15	K-27504-10	K-27503-51	K-27502-65	1M KNO_3
Sulfide S^{2-}	K-27502-41	K-27504-28	K-27503-50	1000 ppm S^{2-}	1M KNO_3
Cyanide CN^-	K-27502-17	K-27504-12	K-27503-50	1000 ppm CN^-	1M KNO_3
Iodide I -	K-27502-23	K-27504-18	K-27503-51	K-27502-73	1M KNO_3
Lead Pb^{2+}	K-27502-25	K-27504-20	K-27503-51	K-27502-75	1M KNO_3
Silver Ag^+	K-27502-41	K-27504-28	K-27503-51	K-27502-91	1M KNO_3

Electrode Preparation

Remove the 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. 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.

Measuring Hints

1. All samples and standards should be at the same temperature for precise measurement, preferably 25°C. Temperature should be less than 80°C. A difference in 1°C in temperature will result in approximately a 2% error.
2. Constant, but not violent, stirring is necessary for accurate measurement.
3. Always rinse the electrode tip with deionized water and blot dry with a fresh tissue between readings to prevent solution carryover. Do not wipe or rub the sensing membrane.
4. Check the electrode for air bubbles adhering to the membrane surface after immersion in solution. Agitate the electrode gently to remove the air bubbles.
5. A slow or sluggish electrode response may indicate surface contamination of the membrane. See **POLISHING THE MEMBRANE**.
6. Use fresh standards for calibration.
7. Re-calibrate every few hours for routine measurement.
8. All samples and standards must be aqueous. They must not contain organic solvents.

Measurement using an Ion Meter (in the Concentration mode)

1. Connect the electrode to the meter.
2. 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.
3. 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.
4. After 1 minute, fix the value in the memory according to the meter manufacturer's calibration instructions.
5. Rinse the electrode tip with distilled water and blot dry.
6. 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.
7. After 1 minute, fix the value in the memory according to the meter manufacturer's calibration instructions.
8. 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.
9. After 1 minute, read the concentration directly from the meter display.
10. The electrode should be re-calibrated every 1-2 hours. Simply repeat Steps 2-7 above.

Interferences

A layer of silver may form on the electrode surface in the presence of strong reducing agents. Insoluble salts of silver may be deposited on the membrane, causing electrode malfunction if high level of ions forming these salts are present in the sample. Proper performance can be restored by polishing. See **POLISHING THE MEMBRANE**.

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° - 80°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 for solution concentrations greater than 10 ppm to several minutes for solution concentration less than 10ppm.

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 one year in normal laboratory use. On-line measurement might shorten operational lifetime. 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

Out of Range Reading

- Defective meter .....Check meter with shorting strap (see meter instruction manual)
- 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 ..... Polish membrane and repeat calibration
- 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 ..... Polish membrane and repeat calibration
- Incorrect reference filling solution ..... Use recommended filling solution
- Incorrect pH ..... Adjust pH to correct operating pH range for the electrode. (**See SPECIFICATIONS)**

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 ..... Polish membrane and repeat calibration
- Defective electrode ..... Change to new electrode

POLISHING THE MEMBRANE

1. Using polishing paper, cut off a 1-2” piece and place frosty side face up on the lab bench (shiny side down).
2. Put a few drops of distilled or deionized water in the center of the paper.
3. Holding the paper steady with one hand, bring the membrane of the electrode down perpendicular to the paper and, with a slight circular motion, gently polish the tip of the electrode against the surface of the polishing paper for a few seconds.
4. Rinse the electrode surface with distilled or deionized water and soak the electrode tip in 100 ppm standard solution for about five minutes before use.

SPECIFICATIONS

Ion	Concentration Range (mol/L)	Concentration Range (ppm)	Interferences	pH Range	Slope (mV) 10-100ppm
Bromide Br^-	5 x 10^{-6} to 1 M	0.4 to 79,900	S^{2-}, I^-, CN^-	2 to 12	52 to 59
Cadmium Cd^{2+}	5 x 10^{-7} to 10^{-1} M	0.01 to 11,200	Ag^+, Hg^{2+}, Cu^{2+}, Pb^{2+}, Fe^{2+}	2 to 12	24 to 29
Chloride Cl^-	5 x 10^{-5} to 1 M	1.8 to 35,500	S^{2-}, I^-, CN^-, Br^-	2 to 12	52 to 59
Copper Cu^{2+}	1 x 10^{-8} to 10^{-1} M	0.006 to 6,350	Ag^+, Hg^{2+}, Cl^-, Br^-, Cd^{2+}, Fe^{2+}	2 to 12	24 to 29
Sulfide S^{2-}	1 x 10^{-7} to 1 M	0.003 to 32,100	Hg^+, Hg^{2+}	> 11	24 to 29
Cyanide CN^-	5 x 10^{-6} to 10^{-2} M	0.1 to 260	S^{2-}, I^-, Br^-	11 to 13	52 to 59
Iodide I^-	5 x 10^{-8} to 1 M	0.006 to 127,000	S^{2-}, Br^-, CN^-	0 to 12	52 to 59
Lead Pb^{2+}	1 x 10^{-6} to 0.1 M	0.2 to 20,700	Ag^+, Hg^{2+}, Cu^{2+}, Cd^{2+}, Fe^{2+}	3 to 8	24 to 29
Silver Ag^+	1 x 10^{-7} to 1 M	0.01 to 107,900	Hg^+, Hg^{2+}	2 to 8	52 to 59