Van London Co.

"When Accuracy Matters"

PPB Sodium Ion Selective Electrode

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GENERAL INSTRUCTIONS

Introduction

The Van London Co. ULTRA LOW LEVEL Sodium Ion Selective Electrode is designed to monitor sodium levels in the ppb range where conventional sodium electrodes are inaccurate. The monitoring of sodium at this level is essential in many applications especially in power plants where sodium impurities in the ppb range cause stress corrosion cracking in high pressure steam turbines and stainless steel generators.

Required Solutions

1. Deionized or distilled water for solution preparation.
2. Sodium Standard, 100 ppm Na^+ NA0AS03 475ml.
3. Ionic Strength Adjuster (ISA), Calcium Hydroxide powder. Add about 0.2 g solid Calcium Hydroxide powder per 100 ml of standard or sample.
4. Dilute Electrode Rinse Solution. To prepare this solution from your own laboratory stock, add 0.2 g solid Calcium Hydroxide to a one liter volumetric flask and fill with distilled water. Use this solution to rinse the electrode between measurements. DO NOT RINSE WITH DISTILLED WATER.

GENERAL PREPARATION

Electrode Preparation

Remove the black shipping cap or soaker bottle covering the electrode tip and the rubber insert covering the filling hole of the reference electrode. Fill the combination electrode with the filling solution shipped with the electrode to a level just below the fill hole. Store the black shipping cap or soaker bottle for later use.

Measurement using an Ion Meter (in the Concentration Mode)

1. By serial dilution of the 100 ppm sodium standard, prepare two sodium standards whose concentration is near the expected sample concentration (e.g 10 ppb and 100 ppb) through a series of dilutions. For example, to make a 100 ppb standard, pipet 10 ml of the newly made 1000 ppb standard into a 100 ml volumetric flask and dilute to volume with deionized water. Next to make a 10 ppb standard, pipet 10 ml of the newly-made 100 ppb standard into a 100 ml volumetric flask and dilute to volume with deionized water. A 1 ppb standard is made by further dilution of the 10 ppb standard.
2. Lower the electrode tip into the least concentrated solution. Begin stirring at a constant rate. Add 0.2 g Solid Calcium Hydroxide to the solution and continue stirring.
3. Allow at least one minute for reading to stabilize before calibrating.
4. Rinse the electrode tip with the dilute electrode rinse solution and blot dry.
5. Lower the electrode tip into the more concentrated solution. Begin stirring at a constant rate. Add 0.2 g Solid Calcium Hydroxide to the solution and continue stirring.
6. Allow at least one minute for reading to stabilize before calibrating.
7. Rinse the electrode tip with the dilute electrode rinse solution and blot dry.
8. Add 100 ml of the sample and 0.2 g Solid Calcium Hydroxide in 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 2-3 hours. Simply repeat Steps 2-7 above.

Measuring Hints

Always rinse the electrodes with electrode rinse solution from a wash bottle between measurements. Use a clean, dry tissue to prevent cross contamination. Never use distilled water.

Constant, but not violent, stirring is necessary for accurate measurement.

All measurements should be made in basic solution. All samples and standards should be adjusted to a pH>12 with Calcium Hydroxide ISA.

Use fresh standards for calibration. Re-calibrate every few hours for routine measurement.

The glass electrode sensing bulb will not be attacked by most organic solvents.

ELECTRODE CHARACTERISTICS

Reproducibility

Electrode measurements reproducible to ±2% can be obtained if the electrode is calibrated every hour. Factors such as temperature fluctuation, drift, and noise limit reproducibility.

Interferences

Table 2 lists some common cations that, if present in high enough levels, will cause electrode interferences and measurement errors or electrode drift when using the sodium ion electrodes.

Electrode drift and slow response could indicate the presence of high interference from the ions listed. Soak the electrodes in electrode storage solution when this happens to restore proper response.

TABLE 2: **Levels of Interfering Ions Resulting in a 10% Error at Specified Levels of Sodium**

Interference	1 ppm	10ppm	100ppm
Li^{+}	1.5ppm	15ppm	150ppm
K^{+1}	17ppm	170ppm	1700ppm
Rb^{+1}	$1.1X10^{4}$ppm	$1.1X10^{5}$ppm	--
NH_4^{+1}	$1.8X10^{3}$ppm	$1.8X10^{4}$ppm	--
Ag^{+1}	.0001ppm	.001ppm	.01ppm
Tl^{+1}	$4.5X1O^{3}$ppm	$4.5X10^{4}$ppm	--

Temperature Influences

The electrode response will shift and change slope with change in temperature. Standards and samples should be at the same temperature. A 2% error results with a 1^{o}C temperature change for a 10 ppm solution.

The electrode can be used at temperatures from -5° - 70°C. Room temperature measurements are recommended, since measurements at temperatures quite different from room temperature may require equilibrium times up to one hour.

Limits of Detection

The upper limit of detection in pure sodium solutions is Saturated.
Free sodium ion concentration down to 1 ppb can be measured in basic solutions. For measurements below 1 ppm, use plastic lab-ware (and low level procedures) since a significant pickup of sodium may occur from glassware due to removal from container walls.

pH Effects

The electrode response to sodium ions is greatly influenced by the pH of the solution. Hydrogen ion interferes with measurements of low level sodium ion measurements, although the electrode can be used over a wide pH range

The pH should be adjusted to a pH greater than 12 by the addition of Calcium Hydroxide ISA to all standards and samples for optimal results over the entire concentration range of sodium.

Electrode Life

The sodium electrode will last one year in normal laboratory use. On-line measurements might shorten operational lifetime to several months. In time, the response time will increase and the calibration slope will decrease to the point calibration is difficult and electrode replacement is required.

Electrode Storage

The sodium ion electrode should be stored in dilute electrode rinse solution during daily use, never in air or in distilled water. For longer storage (longer than two weeks), rinse the sensing glass and cover the glass tip with any protective cap or soaker bottle shipped with the electrode. The reference portion of the combination electrode (or the outer chamber of the reference electrode) should be drained of filling solution, if refillable, and the rubber insert placed over the filling hole.

SPECIFICATIONS

Concentration Range:	Saturated solutions to 1 ppb
pH Range:	9 to 13 (depending on Na^+ level)
Temperature Range:	-5° to 70°C
Interferences:	H^+, K^+, Li^+, Ag^+, Cs^+, Tl^+
Reproducibility:	$\pm$2%
Size:	110 mm length
	12 mm diameter
	1 m cable length