pH METER Protocol: P01-002A

Cleaning and Preventative Maintenance Procedures for Jenway pH Electrodes

Introduction

Analysts frequently encounter pH measurement problems caused by poor electrode performance. Diagnosis and rectification of these problems can be time consuming, leading to poor analytical results and inefficient use of analysts time.

As many common faults can be prevented through adequate care and maintenance this protocol describes the correct care and maintenance steps required to prevent the occurrence of these problems. Adopting the guidance given in this protocol will allow analysts to achieve high quality pH measurements with reduced incidence of poor performance from their pH measurement system.

This protocol describes the recommended cleaning procedures for Jenways' range of pH electrodes. Additional advice is included which may help to improve a pH electrodes performance if it has previously been poorly maintained.

Method

To ensure accurate and reliable analytical measurements, a routine care and maintenance regime should be adopted. In addition to giving the correct measurement result the correct care and maintenance of pH electrodes will result in improved electrode performance and prolonged working life.

During use, electrodes can suffer from contamination to the membrane and diaphragm, which will result in measurement errors or slow electrode response. Adopting a regular preventative maintenance procedure will help to reduce or eliminate these errors. The details of the maintenance steps to be taken, depends on the nature of the samples being measured. Given below are various cleaning procedures that can be employed as either a preventative or corrective action to maintain an electrodes performance or restore the performance of a poorly functioning electrode.

Electrode Cleaning:

Between samples:

- Rinse the electrode with deionised water or appropriate solvent

At the end of each day of use:

- Rinse in methanol
- Soak the electrode in 0.1M HCl for 5 min. Remove and rinse well with deionised water and soak in 0.1M NaOH for 5 min. Remove, rinse again with deionised water and store in pH electrode storage solution (pH 4 buffer is ok for short term storage).

If the electrode has been used in samples containing high concentrations of protein:

- Add 1% pepsin to 0.1M HCl solution and leave the electrode to soak in this solution for 15 min. Remove and rinse with deionised water. Soak in pH 4 buffer for 10 min before use.

If the electrode has been used in greasy, oily or inorganic samples:

- Rinse with detergent or ethanol solution.
- Soak in 0.1M tetrasodium EDTA solution for 15 min. Remove and rinse with deionised water. Soak in pH 4 buffer for 10 min before use.

If the electrodes reference electrolyte has been contaminated:

- Empty the contaminated electrolyte and refill with fresh electrolyte. Rinse the electrode with deionised water and soak in pH 4 buffer for 10 min before use.

Electrode regeneration:

If you are experiencing problems e.g. inaccuracy or sluggish response, noisy, unstable or off-scale readings with your pH electrode carry out the check and procedure listed below:

Check procedure:

1. Check that the filling solution is above the internal elements (not applicable for gel filled electrodes). If not, re-fill the electrode with the specified filling solution.
2. Look for signs of blockage or discoloration of the reference junction. If observed, follow the regeneration procedure below.
3. With the pH meter set to read mV, place the pH electrode in question in pH 7.00 buffer. The reading should be 0 mV ± 30 mV with an Ag/AgCI reference. (This is checking the zero potential). Rinse the electrode with deionised water and lower the electrode into pH 4.00 or pH 10.00 buffer; the reading should read more than 150 mV above or below the zero potential. If not, follow the regeneration procedure below.

Combination electrode regeneration procedure:

1. Empty the reference chamber, rinse with deionised water, empty and refill with the specified filling solution.
2. Soak the electrode in hot (50℃ - 60℃) reference electrolyte for a few minutes.
3. Soak the electrode overnight in pH 4 buffer.
4. Remove any exterior salt deposits with distilled water.
5. If the filling solution does not flow through the junction by this time (generally due to an unusually low junction porosity), use gentle suction to pull filling solution through the junction and repeat from step 2.

Recheck the performance of the electrode using step 3 of the check procedure above.

Sometimes the material clogging the junction requires more specific regenerative action. Should the above procedure fail to restore the electrodes performance follow the electrode cleaning procedures described previously.

If all these fail to restore the electrodes performance, the electrode should be discarded safely and replaced.

Conclusion

pH measurement is a common and important analytical tool in the modern laboratory. To ensure accurate results pH electrodes must be maintained in good working order. The implementation of a good care and maintenance regime will repay the time and effort involved in terms of improved working life for the electrode and more importantly, an improvement in the accuracy of pH measurement. It will also help to prevent the reoccurrence of possible electrode problems in the future.