

## 5. RECONDITIONING

When reconditioning is required due to electrode aging (see Helpful Operating Techniques, Part 9), the following chemical treatments can be tried. They are presented in the order of the severity of their attack on the pH glass and may not improve ( and in some case actually further deteriorate ) electrode performance.

### **Note :**

Use proper precautions when handling these hazardous chemicals. Ammonium bifluoride and HF (hydrofluoric acid) are extremely hazardous and should only be used by qualified personnel.

- 1) Immerse the electrode tip in 0.1N HCL for 15 seconds, rinse in tap water and then immerse tip in 0.1N NaOH for 15 seconds and rinse in tap water. Repeat this sequence three times and then recheck the electrode performance. If performance has not been restored, try Step 2.
- 2) Immerse the tip in a 20% solution of  $\text{NH}_4\text{F}\cdot\text{HF}$  (ammonium bifluoride) for 2 or 3 minutes, rinse in tap water and recheck performance. If performance has not been restored, try Step 3.
- 3) Immerse electrode tip in 5% HF for 10 to 15 seconds, rinse well in tap water, quickly rinse in 5N HCL, rinse well in tap water and recheck performance. If performance has not been restored it is time to get another epoxy body, sealed reference combination pH electrode.

# PH ELECTRODE

## 1. HELPFUL OPERATING TECHNIQUES

- 1) The electrode is shipped in a plastic bottle containing a solution of 4 buffer and potassium chloride. The electrode should remain in the bottle until it is used. If the electrode is used infrequently the bottle and its solution should be saved and the electrode stored in it (see the Electrode Storage Section).
- 2) During shipment the air bubble in the electrode's stem may move into the bulb area. If bubbles are seen in the bulb area, hold the electrode by its top cap and shake downwards as is done with a clinical thermometer.
- 3) Vigorously stir the electrode in the sample, buffer or rinse solution. This action will bring solution to the electrode's surface more quickly and improve speed of response.
- 4) After exposure to a sample, buffer or rinse solution, shake the electrode with a snap motion to remove residual drops of solution. This action will minimize contamination from carryover.
- 5) As a rinse solution, use a part of the next sample or buffer which is to be measured. This action also will minimize contamination from carryover.
- 6) When calibrating, use a buffer close in value to that expected from the sample. This action will minimize span errors.
- 7) Keep buffers and samples at the same temperature. This action will eliminate the need to correct values for temperature effects.

8) pH readings stabilize faster in some solutions than others; allow time for the reading to stabilize. In general, buffers provide stable readings in several seconds (tris buffers take somewhat longer) while samples usually take longer times.

9) Keep in mind that all pH electrodes age with time. Aging is characterized by shortened span and slower speed of response. If the meter has a manual or microprocessor slope (span) control, the control can be adjusted to compensate for electrode span errors ( but will not effect the speed of response ). Aging is best detected by calibrating the electrode in, for example, 7 buffer, then rinsing and placing the electrode in 4 buffer. As a rule, if the span is 10 % or more in error (a reading of 4.3 or higher for this example) the electrode should be cleaned and retested (see the Electrode Cleaning Section ) or reconditioned ( see the Reconditioning Section ). If performance is not restored the electrode should be replaced.

## **2. CALIBRATION AND MEASUREMENTS**

As a rule, follow the procedures recommended by the pH Meter manufacturer keeping in mind the Helpful Operating Techniques given above. The frequency of calibration is a function of the electrode, the pH meter and the solutions the electro measurements :

- 1) Remove the electrode from its soaker bottle and save the bottle.
- 2) Vigorously stir the electrode in a rinse solution.
- 3) Shake the electrode with a snap action to remove residual drops of solution.
- 4) Vigorously stir the electrode in the buffer or sample and allow the electrode to rest against the beaker's wall.

- 5) Allow the reading to stabilize and then take the reading.
- 6) Repeat these steps for each sample or buffer determination.
- 7) Between readings place the electrode in a beaker containing about 2 cm (1 inch) of, preferably, pH 4 buffer or distilled water.

## **3. ELECTRODE STORAGE**

When pH readings are made infrequently, for example, several days or weeks apart, the electrode can be stored simply by replacing it in its soaker bottle. First, slide the cap onto the electrode, then the o-ring, then insert the electrode into the bottle and firmly tighten the cap. If the solution in the soaker bottle is missing, fill the bottle with pH 4 buffer.

## **4. ELECTRODE CLEANING**

Coating of the pH bulb can lead to erroneous readings including shortened span. The type of coating will determine the cleaning technique. Soft coatings can be removed by vigorous stirring or by use of a squirt bottle. Organic chemical or hard coatings should be chemically removed. Only in extreme cases should the bulb be mechanically cleaned as abrasion can lead to permanent damage. If cleaning does not restore performance, reconditioning may be tried.