CARE OF pH ELECTRODES

Dehydration

Left out of solution, the pH glass membranes will become dehydrated. After this happens, the pH sensor will have slower response and a higher than normal impedance when it is put back into operation. Repeated dehydration and re-use will dramatically reduce the normal service life of the pH sensor. Prolonged dehydration will cause the glass membrane to completely fail.

If the reference electrode becomes dehydrated, it also will no longer operate properly. The electrolyte will leach out of the electrode cavity, through the junction(s), forming salt crystals on the junction surface. Over time, leaching will weaken the electrolyte potential, and may also cause a phenomenon known as a bridging effect. Both of these conditions will increase the output impedance, making the reference electrode output unstable. With continued dehydration, the impedance will rise to a level that becomes unusable to the pH meter.

Factors Detrimental to Electrode Life

A pH electrode operates similar to a hydrogen electrode within the range of

0.00 - 12.00 pH (where the alkali error affects the reading). This is also known as a sodium ion error. Within this range, the output slope of the electrode corresponds to the theoretical 59.16 mV as defined by the Nernst equation.

As with all glass, pH glass is susceptible to chemical attack. Temperature changes can alter the rate of this attack. For every 30°C rise in temperature, the rate of attack increases ten-fold. Accordingly, electrode life is shortened in process solutions, with elevated temperatures. Strong acids and, to a greater extent, strong alkaline solutions attack the glass membrane. Even neutral solutions that contain high concentrations of alkaline ions, sodium ions in particular, attack the glass. Using a pH sensor with a glass formulation that is inappropriate for the application may render the sensor inoperable after only a short time without any visible glass defects.

Hydrofluoric acid (HF) will readily poison the glass membrane when the pH is below 6.00. The greater the fluoride ion concentration, the faster the electrode will fail. The fluoride strips away the gel layer of the glass membrane rendering it inoperative.

A special electrode manufactured from antimony is available for measuring pH in solutions containing HF. The antimony electrodes exhibits similar properties to glass electrodes within certain limits. One drawback is that the repeatability and speed of response for an antimony electrode is inferior to that of a glass electrode. Also, antimony electrodes are only linear between 3.0 and 8.0 pH, and should only be specified when hydrofluoric acid dictate their use.

Transportation

Freezing, extreme heat, vibration, and mechanical shock must be avoided when transporting electrode, whether within a facility, or from one facility to another. Always try to reuse the original box and packing materials, if possible, to transport electrodes.

When shipping the electrode using motor freight, select a carrier that will guarantee that the package will not be exposed to extreme temperatures. usually sending the electrode by an overnight delivery service ensures that the package will not be exposed to the elements long enough to damage the electrode.

Storage

pH sensors (electrode pairs, combination electrodes, and differential styles) should be stored in ambient conditions between 10 and 30°C. Protective caps, as well as solution storage caps, should be kept intact and installed onto the end of the sensor, as provided by the manufacturer.

The best solution for storage purposes is a 3 to 3.5 M KCI solution. This solution provides a neutral-to-slightly acidic environment for the glass electrode, and will not impose a memory on the glass (much as Ni-Cad batteries can have memories imposed upon them when they are not fully discharged prior to recharging). Should KCI solution not be available, appropriate substitutes in order of preference are:

pH 4 buffer
distilled water
tap water

Under these conditions, the glass measuring and reference electrodes can have a shelf life of three to five years.

NOTE: Periodically check to verify that the storage solution has not evaporated.