OAKTON INSTRUMENTS

TECH TIPS

P.O. Box 5136 • Vernon Hills, IL 60061 • Toll-Free 1-888-4 OAKTON (462-5866) • Fax: 847-247-2984

MEASURING pH OF PURE WATER

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"What could possibly be so difficult about reading the pH of pure water? It should be neutral-pH 7.0, and there are no interference's", common sense says. In practice, it can be quite difficult and often frustrating to obtain reproducible pH values in samples with low-ionic strength. Water that has very few ionic species is said to be low in alkalinity, ionic strength, or have low conductivity/high resistivity such as distilled or deionized (DI) water. It is common to attain different pH values with new, sealed electrodes that calibrate perfectly in pH buffers when attempting to measure DI water. This is due to the varying junction potentials that develop across the reference junction. Some techniques and product recommendations for overcoming such limitations will be discussed here.

Choosing a pH electrode:

More expensive double-junction and calomel electrodes have a number of advantages over traditional electrodes, however they are generally no better than their counterparts for pure water applications. The best choice is a refillable, liquid-filled electrode, ideally made of low resistance glass. A flowing reference junction has a higher flow rate to minimize junction potentials. Sealed electrodes, usually gel-filled, are best known for their "long-life", due in part to the extremely slow leak rate of the reference solution. However, a fast leak rate is desirable with pure water so a pH potential can be established more quickly. This is also the reason why sealed electrodes should not be stored in DI water-the sample will accelerate the leaching of reference solution, which can not be replaced.

Electrostatic interference:

Since ultra pure water is a bad conductor, it can also be a source of static potentials. These static potentials may be present problems in measuring pH. To compensate for this interference, pH electrodes are available with a special shielded or grounded compartment. Such electrodes are expensive and specifically designed for measurement of ultra pure water.

Other measurement tips:

• It is also beneficial to measure pH in the smallest sample volume possible. Direct pH measurement in large volume samples such as drums or tanks and other samples with flowing or moving water tend to fluctuate and will require excessive stabilization time.

• Addition of a tiny amount of KCl will increase ionic strength to the sample and improve response time. Only high purity KCl should be used as trace contaminants in low-grade KCl can artificially alter the pH.

• Maintain good-laboratory practices including; using clean glassware, avoiding cross-contamination after calibration by rinsing thoroughly with DI water, using only certified calibration standards, etc.

• Temperature compensation should be used during measurement and calibration. Calibrate daily at multiple pH calibration points.

• Minimize exposure of your sample with air. CO2 gas absorption can actually decrease pH.