pH Theory

ASI...MEASURING YOUR SUCCESS!

The pH of a solution measures the degree of acidity or alkalinity relative to the ionization of water.

Measuring pH involves comparing the potential of solutions with unknown [H+] to a known reference potential. pH meters convert the voltage ratio between a reference half-cell and a sensing half-cell to pH values.

- pH 0 = +414mV (acidic)
- pH 4 = +177mV (acidic)
- pH 7 = 0mV (nuetral)
- pH 10 = -177mV (basic)
- pH 14 = -414mV (basic)

The voltage on the outer glass surface changes proportionally to changes in [H+]. The pH meter detects the change in potential and determines [H+] of the unknown by the Nernst equation:

E=E1 + (2.3RT/nF) log(unknown [H+]/internal [H+])

Where:

- E = total potential difference (measured in mV)
- E1 = reference potential
- R = gas constant
- T = temperature in Kelvin
- n = number of electrons
- F = Faraday's constant
- [H+] = hydrogen ion concentration

A pH electrode consists of two half-cells; an indicating electrode and a reference electrode. Most applications today use a combination electrode with both half-cells in one body. Over 90% of pH measurement problems are related to the improper use, storage or selection.

Since pH glass electrodes measure H+ concentration relative to their reference half-cells, they must be calibrated periodically to ensure accurate, repeatable measurements. Although calibration against one buffer typically ensures accurate pH readings, frequent two-buffer calibrations ensure the most reliable results. When selecting buffers, attempt to purchase buffers on either side of your pH value you will be measuring.

When finished using your electrode, you should always rinse it with DI water and blot the end dry witha paper towel. Always store your electrode in storage solution to ensure that your electrode glass stays hydrated. The storage solution will also keep your reference wet and slow down the ion exchange across the reference.

When cleaning your pH electrode, please use a mild soap and warm water. Do not use HCl prior to soap and water. Do not use abrasives on the pH glass.

APPLICATION GUIDE

APPLICATION	ELECTRODE
Wastewater	Double-junction
Pharmaceticals	Calomel (Hg/Hg2Cl2) or double junction
Biological samples	Calomel (Hg/Hg2Cl2) or double junction
Boiler feeder water	pHastrode Series electrode
Drinking water	Standard Ag/AgCl with single junction
Heavy metals	Double junction
Soils	Double junction
Flat or low sample volumes	Flat glass electrode
Cheese or semi-solids	Spear tip glass electrode