

METTLER TOLEDO APPLICATION NOTE

pH Measurement In Sulfide-Bearing Effluents

BACKGROUND

Environmental concerns and legal requirements in many countries dictate that industrial effluents must be neutralized before being sent on to a filtration plant. Only accurate and reliable pH measurement can guarantee effective automatic neutralization of such effluents. In this process, pH is measured continuously and electrodes must be capable of working with minimum maintenance and without the need for frequent calibration.

Important for accurate pH measurement is the faultless functioning of the reference electrode, which must supply a constant baseline potential. The reference electrode (comprising an internal cell cartridge and the reference electrolyte) is in contact with the sample medium via some type of junction.

THE PROCESS

Industrial effluents are typically heavily contaminated. There is a constant risk that the fine pores of a standard ceramic diaphragm will be blocked by suspended particles. The result is a high and fluctuating junction potential. Thus, the basic condition for accurate pH measurement (constant reference electrode potential) is no longer assured.

Sample media containing sulfides present a particularly difficult case. Most reference electrodes have an internal cell, which requires the presence of free silver ions in the reference electrolyte. These ions react at the diaphragm with sulfide ions from the sample medium, producing a scarcely soluble silver sulfide salt, which blackens and blocks the diaphragm. The resulting uncertainty in the junction potential produces a corresponding uncertainty in the measured pH value.

INSTRUMENTATION

METTLER TOLEDO has developed a polymerized reference electrolyte, which eliminates the need for a ceramic diaphragm. InPro[®] 4500VP electrodes allow direct contact between the reference electrolyte and the sample medium via an annular junction many times larger than the pore size of ceramic junctions. The likelihood that an annular junction will be blocked is extremely remote.

Also, the polymerized electrolyte dramatically reduces access of silver ions to the junction region and minimizes opportunities for silver salts to precipitate. Thus, junction potentials at the annular junction remain low and constant, assuring a high degree of accuracy and good long-term stability.

The 2100 pH analyzer is recommended for use with the InPro 4500VP in this application.

Calibration

The pH electrode is calibrated in pH 7 and 4 buffer solutions, with the frequency of calibration depending on the degree of accuracy required and the chemical composition of the sample medium. Initially, until experience indicates that a longer interval is suitable, we recommend one calibration per month for an accuracy on the order of pH = 0.2.

Maintenance

InPro 4500VP electrodes are easy to service. The electrolyte does not require topping off. Electrodes with the solid polymer reference system should be stored when not in use in the fitted hydration cap provided, filled with 3 mol/liter KCl solution or METTLER TOLEDO Friscolyt-B[™] solution. They should not be stored dry, in distilled water or in a large volume of solution with low KCl concentration, all of which shorten the electrode life.

PRODUCTS

2100 pH Analyzer

- Detachable front panel and plug-in terminals for ease of installation
- All functions accessible through the keypad for increased ease of use
- Continuous sensor and transmitter diagnostics to monitor performance
- FM certification for Class I, Div 1 & 2 Environments and CSA General Purpose Approval
- 3 year warranty

InPro[®] 4500VP Solid Polymer pH Electrode

- Patented Xerolyt[®] solid polymer reference system maintains a stable potential for accurate and repeatable pH measurement and low maintenance
- Open junction eliminates reference clogging and extends sensor life
- High pressure resistance eliminates requirement for pressurizable housing
- Xerolyt solid polymer is particularly suitable for use in emulsions, suspensions, heavily contaminated or sulfide-containing media, and solutions with a high concentration of suspended solids