Conductivity

The specific conductance of demineralized water is generally expressed as micromhos per centimeter (mmhos) at 25° centigrade. There are 4.99 micromhos per ppm total electrolytes as $CaCO_3$ when measuring demineralized water with the pH of 8 to 9, typically from a two bed plant using a strongly basic resin. There are 2.53 micromhos per ppm as $CaCO_3$ when measuring water with a pH of 5 to 7.5, from a system using a weakly basic anion resin. Conductivity measurements on a demineralizer are normally made after the anion exchange unit or mixed bed.

The following precautions should be taken in making pH measurement in high purity water:

1. Prevent exposure of the water sample to air which contains CO_2. The pH of pure water in complete equilibrium with CO_2 from the air is about 5.5 pH determination by batch sampling of high purity water - (higher than 5.0 micromho) is not advisable because of the possible contamination by the CO2 from air. It is best to locate the laboratory pH instrument near the sampling point and direct via polyethylene tubing an upwardly flowing sample in the open test beaker.

2. Do not use long lengths of gum rubber or flexible tubing such as Tygon because these are semi-permeable and CO2 from the air diffuses through the walls of the tubing to lower the pH. It is best to use more 'opaque' tubing such as unplasticized PVC, or polyethylene.

CONDUCTIVITY VS. PH

pH	Conductivity mmhos 25°C
7.0	0.055
6.7	0.10
6.5	0.14
6.0	0.44
5.5	1.4
5.0	4.2
4.5	13.0
4.0	44.0

DIFFERENTIAL CONDUCTIVITY

A conductivity differential or ratio detector will indicate when breakthrough is about to take place in a cation unit. Two conductivity probes, one lower than the other in the cation bed are connected to a remote Wheatstone Bridge arrangement so that the difference or ratio of the conductivity of the water between the two points is measured. Since the difference or ratio of conductivities are approximately the same during the run, a change in the difference or ratio will indicate the start of breakthrough at the end of the run.

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