

## Application Note

### Ion Methods

There are a number of different methods used for making ion electrode measurements. The following is a summary of the five main methods. The Denver 200 Series has built in software to make the first three methods simple.

#### **Direct Reading**

The simplest method; make a standard curve by placing in the electrode in two or more ion standard solutions, then merely place the electrode in each sample to read.

#### **Analate Addition (aka Sample Addition)**

This method is slightly more complicated but very useful when the sample composition consists of interfering ions, has varying temperatures or has a ion concentration outside of the detectable range of the probe. Place the ion electrode (with an already known slope) in a standard solution, let the meter read the electrode potential, and then add a known amount of the sample. When the meter rereads the electrode signal, it can calculate the ion concentration of the sample.

#### **Known Addition (aka Standard Addition)**

This method is slightly more complicated but very useful when the sample composition is unknown or there are high concentrations of complexing agents. Place the ion electrode (with an already known slope) in the sample, let the meter read the electrode potential, and then add a known amount of standard solution. When the meter rereads the electrode signal, it can calculate the ion concentration of the sample.

#### **Known Subtraction (aka Standard Subtraction)**

This method is often used when stable standards can't be prepared. The method is similar to known addition, but instead of adding the ion being measured by the electrode, you add a known amount of an ion that subtracts or removes the ion being measured. For example, when measuring sulfide one can use a lead standard solution. The lead precipitates sulfide as lead sulfide, removing sulfide from solution, and changes the electrode potential. Again, the meter measures the electrode potential before and after and can calculate the ion concentration in the sample.

#### **Analate Subtraction (aka Sample Subtraction)**

This method can measure an ion for which no ion selective electrode exists however it is the most complicated method. Add an aliquot of sample to a standard solution, where the ions in the standard are subtracted or removed by the ion of interest in the sample. For example, measuring oxidants like ozone. Use a standard solution of iodine and an iodine electrode. The ozone removes some of the iodine and allows the measurement.