

APPLICATION NOTE - ION SELECTIVE ELECTRODES

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HOW TO USE ION SELECTIVE ELECTRODES

You will need the following equipment:

- An ion meter
- A combination ion selective electrode
- Two or more standard solutions.
- A bottle of water for rinsing the electrode.
- A stirring device (e.g. magnetic stirrer).

What can I measure and where?

Before venturing off and wasting time trying to do the impossible just check that your sample meets the following criteria:

- The sample must be water based or soluble in water.
- The sample must be between 0° and 50° C.
- The sample must not dissolve PVC.
- The sample must have a concentration of the ion being measured within the specified range.
- The pH of the sample must be within the specified limits.
- The sample should not contain significant amounts of the interfering ions.

Standard Solutions

- A lot of time and trouble is saved purchasing stock standards.
- Make sure that the highest standard greater than that of your samples and that the lowest standard is below your lowest concentration sample.
- Your highest standard should also be at least 10 times more concentrated than the lowest.
- Your standards should always be under similar conditions to your samples (e.g. samples and standards should be at the same temperature).

Ion Strength Adjustment

Ionic strength is the total concentration of all ions in your sample. The greater the number of ions in solution the less active the individual ions are. The outcome of this is that e.g. you will get a higher result for say 100 ppm nitrate sample in spring water than 100 ppm nitrate sample in sea water using the same standards and no ionic strength adjustment.

We can eliminate the problem completely making the total ionic strength of all samples and standards the same. We can do this by adding a small volume of a concentrated inert solution to each standard and sample. This is usually 2 ml of ISA (Ionic Strength Adjuster) to 50 ml of standard and sample.

Interferences

ISE's are not perfect. They do suffer from interferences of other ions to a greater or lesser degree. The best advice is to consult the ISE table. If there is an ion present in the samples that is listed as an interferent then you will need to think about a few points:

- If the ions you are measuring are greater in concentration than the interferent you can usually ignore it.
- In many instances interfering ions can be eliminated using chemicals.
- You can use incremental techniques, e.g. Known Addition.

Good Measurement Practices

- While calibrating or measuring all solutions should be stirred gently (e.g. with a magnetic stirrer) to ensure the electrode gives a true representation of the beaker contents.
- Calibration solutions should be chosen which have values near the expected sample value.
- Only fresh calibration solutions should be used! Changing all solutions daily is a good practice.
- All solutions should be maintained at equal temperature.
- Rinse the electrode twice between measurements: first thoroughly in distilled water and then with a small amount of the next sample to be measured.
- Allow the electrodes sufficient time to stabilise while calibrating or measuring. A stability indicator on most of our meters prompts the user when readings should be taken.