



## Things We're Dwelling on Now...

# Potholes on the Road of Acid Measurement

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Some lab procedures are difficult to carry out (aeration/oxidation, Gold Coast, converting lead to gold) or difficult to interpret (Ripper, paper chromatography, test results from your doctor). Acid measurements, specifically pH and titratable acidity (TA), are a more solid and predictable refuge, free from interference and sources of error at every turn—or so we like to think. The truth is that there are plenty of places to run into trouble in an acid measurement, from the pH electrode to the make-up water for a TA. I hate those news articles with titles like “Your toaster: a ticking time bomb?”, so I’m not trying to make you more worried. Consider this a troubleshooting guide and a resource for when things just aren’t making sense.

**pH Electrode-** As the sales rep told me when we were setting up our auto-titrator, “the electrode is a consumable.” Sure, it lasts longer than the sodium hydroxide, but not as long as the body of the meter. There can come a time when readings are no longer stable and calibrations are less and less successful and the only thing left to do is to replace the electrode. I know it feels like changing a light bulb that hasn’t burned out and costs more than \$100, but the instant performance upgrade is pretty satisfying. It goes without saying that well-cared-for electrodes perform better, last longer, talk back less, etc. Avoid touching the electrode, keep the electrode filler solution topped up (and change it periodically), don’t store the electrode dry, and so forth. If you are having problems that seem to be electrode or hardware related, we’ve found a resource on the web to help diagnose the source of the issue. This is not an endorsement for the company or products, but the file is pretty darn handy: <http://www.reagecon.com/techpapers/electrodecmv5.pdf>



Where so many good measurements go wrong.

**Calibration-** “But I calibrate the meter every time I use it,” we all say. That’s good. Using a three point calibration or at least a third buffer check is even better. There are two potential problems at play here. The first is that a calibration is basically fitting a line, and with only two points (the usual) it’s easy to get a nice straight line. Second, the usual calibration points for pH readings are 4.00 and 7.00. Many New York wines can be closer to pH 3.00 than to pH 4.00, and since pH is a logarithmic scale, the difference between 3 and 4 is significant—a factor of ten, to be exact. So what to do? The ideal scenario is to calibrate with 3.00, 4.00 and 7.00, if your meter lets you. Next best, if your meter will only let you do a two point curve, is to use 3.00 and 7.00 and measure the 4.00 buffer to see how it looks. If you’re only allowed 4.00, 7.00, and 10.00 calibration standards by your meter, then you can use the 4.00 and

7.00 to calibrate and measure the 3.00 standard. Beware: you're still measuring outside your calibration range, but at least you'll have some idea of your electrode performance. If you don't have a 3.00 buffer (and why not?), make up a saturated solution of potassium bitartrate (5 g in 100 mL water); at room temperature, the pH should be about 3.56. Keep in mind that when you're running TAs, the pH you're really interested in is 8.20, and you'll want to calibrate with 9.00 and/or 10.00 as opposed to the low range buffers.

**Water and CO<sub>2</sub>**- We all learn early on that pure water has a pH of 7.00, but we also learn early on that we should expect an 8% annual return on our retirement savings and that house prices never fall. Theoretical ideals often don't hold up in reality, and even water can let us down. Municipal and well water sources may have impurities and/or added chemicals, and any water that sits out will pick up carbon dioxide and convert it to carbonic acid. All told, really terrible water could change a TA by more than a gram per liter, which is significant. Distilled or de-ionized water will remedy these problems, but systems can be expensive and require frequent filter changes and maintenance. Distilled water from the store, with care taken to prevent CO<sub>2</sub> pick-up (container full and closed), can keep the interference to an acceptable range. To see how large an impact your various water sources are (or are not) having on your samples, check the same sample with a few different waters. You may find that your water is fine, or that you can apply a correction factor (you'll need to do a lot of checks to make sure the factor is sound, of course). To minimize the effect of carbon dioxide on the water, adjust to pH 8.2 with sodium hydroxide before adding the sample (if you don't do this already).



Count the ways this probe is being mistreated.

While small measurement errors are not necessarily cause for alarm, we calculate SO<sub>2</sub> additions based on pH readings, and adding either too much or too little SO<sub>2</sub> will lead to trouble. Furthermore, the thought of potentially damaging a wine through an incorrect acid correction is not a happy one. So: worry appropriately. My usual mantra is to control or at least be aware of as many variables as possible, so the remaining ones can bring only so much mayhem, and I think the mantra applies here too. Good luck out there, and keep an eye on that toaster.

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