Application Note AN-T-219

pH value and TTA in flour, dough, and bread

Determination of the pH value and the total titratable acidity according to AOAC 943.02, 981.12, and AACC 02-31.01

Bread is one of our most important staple foods. In order to consistently manufacture a high quality product, it is critical to measure certain parameters e.g. pH value or the acidity content in the raw materials and during the production steps. These factors have a major influence on the taste and storage lifetime of the final product.

Many bakers rely on precise weighing of their raw materials, or empirical values. However, these methods only work to a limited extent. With sourdough for example, the contained lactic acid changes the pH value and the degree of acidity, among other things. These parameters determine factors including taste, aroma, consistency, and shelf life—in short, the quality. Therefore, consistent product quality is only possible with precise measurements during the process.

SAMPLE AND SAMPLE PREPARATION

This application is demonstrated on white flour, bread dough made from white flour, unbaked sourdough made from wheat and rye flour, and both white and whole wheat bread.

No sample preparation is required.

EXPERIMENTAL

The determinations are carried out on an Eco Titrator equipped with an Ecotrode Gel with NTC, a 913 pH Meter, and a Polytron for sample size reduction.

An appropriate amount of sample is weighed into the sample beaker and CO_2-free water is added. If necessary (e.g. for dough or bread), the sample is homogenized with the Polytron and the sample is allowed to stand for 30 minutes.

For determination of the pH value, the supernatant is carefully decanted and the pH is measured immediately with the 913 pH Meter.

For the TTA measurement, the solution is titrated until after the first equivalence point with standardized sodium hydroxide solution is reached.

Figure 1. Eco Titrator and a 913 pH Meter with a maintenance-free Ecotrode Gel with NTC.

RESULTS

Well-defined pH values and titration curves are obtained for the tested samples.

The results are summarized in Table 1 and Table 2. An example titration curve is displayed in Figure 2.

Table 1. Results for the pH value according to AOAC 943.02 and AOAC 981.12 with a 913 pH Meter equipped with an Ecotrode Gel with NTC.

Sample (n = 6)	CMean pH value	SD(rel) in %
White flour	6.19	0.0
Bread dough	7.09	0.2
Unbaked sourdough (wheat flour)	5.64	0.3
Unbaked sourdough (rye flour)	4.87	0.1
White bread	5.50	0.2
Whole wheat bread	6.10	0.2

Table 2. Results for the TTA measurement according to AACC 02-31.01 with an Eco Titrator equipped with an Ecotrode Gel with NTC.

Sample (n = 6)	Mean in mL c(NaOH) = 0.1 mol/L per 10 g sample	SD(rel) in %
White flour	2.72	2.2
Bread dough	4.18	0.9
Unbaked sourdough (wheat flour)	5.07	2.2
Unbaked sourdough (rye flour)	6.70	1.5
White bread	4.55	5.5
Whole wheat bread	3.34	4.0

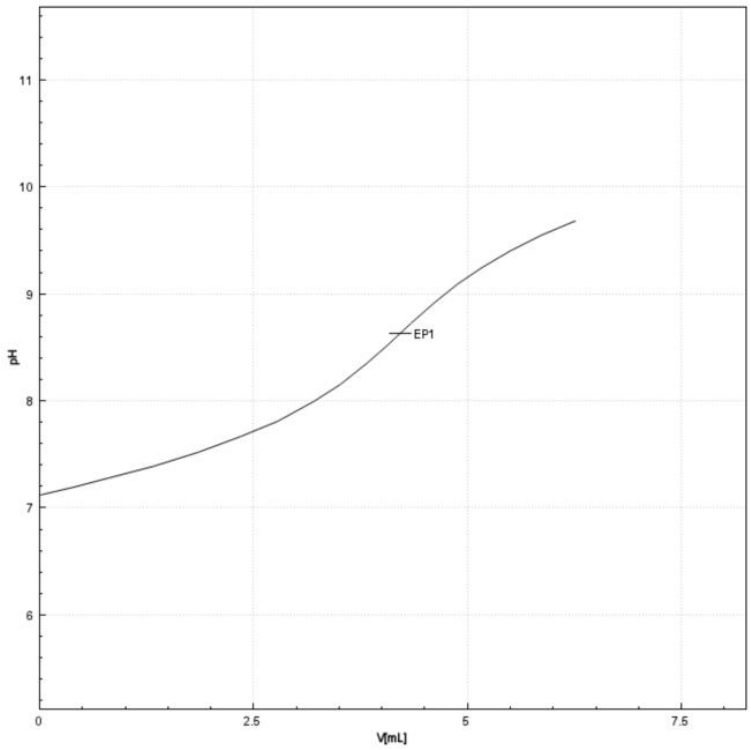

Figure 2. Titration curve of the determination of the TTA of bread dough on an Eco Titrator.

CONCLUSION

Both the Eco Titrator and the 913 pH Meter are unbeatable in combination to determine the reliable key figures pH value and the total titratable acidity. They are low-priced, user-friendly, and take up little space. Pre-installed methods on the Eco Titrator make it easier for users without laboratory experience to get started with precise and fast titrations, perfect for bakeries.

CONTACT

Metrohm Nordic AB
Box 11065
161 11 Bromma
mail@metrohm.se

CONFIGURATION

Eco Titrator Acid/Base

The compact Eco Titrator with integrated magnetic stirrer and touch-sensitive user interface is ideal for routine analysis. It provides GLP-compliant results with minimum space requirements at all times (approx. DIN A4).

The Eco Titrator Acid/Base offers you the complete package for acid-base titration in aqueous solutions. Included in the package are titrators, a 20 mL cylinder unit, and a combined Ecotrode plus pH electrode.

913 pH Meter, laboratory version

Portable two-channel pH measuring instrument for measuring pH/mV and temperature. You will be optimally equipped for measurements in the field and in the laboratory with this battery-operated measuring instrument with a stand plate.

- Portable pH meter with built-in battery pack and two galvanically isolated pH measuring inputs.
- Analog pH measuring input for Metrohm standard pH electrodes
- Digital pH measuring input for the intelligent pH electrodes from Metrohm
- Robust, water-tight, and dust-tight housing (IP67) for tough outdoor and laboratory use
- LCD color display with background illumination making results easy to read
- USB interface for simple data export to PC or printer
- Large internal memory (10,000 data sets)
- Pin-protected User mode and Expert mode, prevents unwanted parameter changes
- GLP-compliant printout and data export with User ID and timestamp

Ecotrode Gel with Pt1000

Maintenance-free pH electrode (gel electrolyte) with integrated temperature sensor (Pt1000) for routine pH measurements in identical samples. This electrode is stored in c(KCl) = sat. (6.2308.000) and is not suitable for ion-deficient solutions.

Thanks to the lifetime indicator, you always know early on when the electrode needs to be replaced.