LALLEMAND BREWING

Measuring Titratable Acidity

What is Total Acidity?

- Total amount of organic acids in a solution (which can include lactic, acetic, tartaric, phosphoric, succinic, citric, etc.)
    - Typically each acid is reported as a concentration in grams per liter (g/L)

What is Titratable Acidity?

- An approximation of total acidity, measures both associated and dissociated hydrogen ions
    - Measures how much a strong base (ex. sodium hydroxide (NaOH)), it takes to reach a basic pH (typically pH 8.2).
    - This details the total available hydrogen ions and is a more accurate to measure of perceived sourness
    - Is typically reported in either g/L or a percent TA, g/100ml.
    - In beer, this calculation is used to measure lactic acid (the most prominent acid in beer), for other beverages (cider for example) this calculation can be modified to reflect their prominent acid.

How to Measure:

What you will need:

- pH meter
- degassed beer sample
- stir plate with magnetic stir bar
- sodium hydroxide (NaOH) in liquid form (typically sold in 0.1M form)
- Pipettes and glassware, with precision down to 0.1 mL (25 or 50mL buret)
- Gloves

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Procedure:

1. Take the specific gravity of the beer.
2. Take a precise amount of degassed beer (ex. 50ml) in a beaker
3. Using the liquid NaOH and your pH meter, measure a precise amount of the NaOH (usually around 0.1-0.5ml) into your beer sample, stirring each time you add the NaOH
4. Take a pH reading
5. Continue adding the NaOH in 0.1-0.5ml increments until you reach 8.2pH

(at this pH you have reached the point where NaOH and lactic acid are equivalent in the solution.)

6. Add up the 0.1-0.5ml increments, or the total volume in ml, it took to get to 8.2pH point. This is your ml 0.1M NaOH number.

Calculating mL Lactic Acid and g/L of a Specific Acid

- Now we can do math. You will need:
  1. volume of beer
  2. the ml of 0.1M NaOH used to get to 8.2pH
  3. and the specific gravity of your beer.
- There are two different calculations that will provide you ml of lactic acid per 100g of beer (Equation A below) or, another calculation to provide you with g/l as a specific acid (**Equation B, more common**).

A. ml Lactic Acid per 100g beer Calculation:

Titratable Acidity (TA) as lactic acid =

ml 0.1M NaOH x 10/ml of beer x specific gravity

Ex. 50ml of beer at 1.010 specific gravity required 5.6 ml of 0.1M NaOH to reach ph 8.2

TA = 5.6ml x 10/50 x 1.010

TA = 56/50.5 = 1.11

Or 1.11ml of 1.0M alkali per 100 g of beer.

B. g/l as a Specific Acid Calculation:

(Using the 50ml of beer at 1.010 specific gravity that required 5.6ml of 0.1M NaOH solution)

1. Total Acidity (mol/L) = ml x 0.1M / vol of beer

Ex. Total Acidity (mol/L) = 5.6ml x 0.1M / 50ml
= 0.0112 mol/L

Now we need to find the g/L of lactic acid:

2. g/L Lactic Acid = TA (mol/L) x (90g/mol)*

Ex. g/L Lactic Acid = 0.0112 mol/L x (90g/mol)
= 1.008g/L

*The 90g/mol is a standard correction for lactic acid

You can also express this number as a % lactic acid by:

3. % Lactic Acid = g/L lactic acid / 1,000g

Ex. % Lactic Acid = 1.008g/L / 1,000g = 0.0018

x 100 = 0.18%

References:

ASBC Method of Analysis, Beer Method Number 8

For more information you can visit
https://www.asbcnet.org/Methods/BeerMethods/Pages/Beer-8-SuppInfo.aspx