Volumetric Analysis of $CaCO_3$ in Antacids

XXX YYY

Method

Antacids contain basic salts (i.e. $CaCO_3$) that help to neutralize the excess stomach acids (i.e. HCl) that cause heartburn. In my analysis, I used back titration to determine the $CaCO_3$ content in a commercial antacid and its neutralizing power.

The neutralizing power can be determined by dissolving the tablet in an excess of acid of known concentration (6M HCl) and titrating with a standardized NaOH solution.

Through titration, I am able to determine the number of excess moles of HCl remaining in the solution, and therefore determine the number of moles that reacted with the tablet. **The chemical reaction is :**

$NaOH + HCl \rightarrow NaCl + H_2O$

Chemistry and Sample Prep

For each sample, I dissolved one antacid tablet in a 250mL Erlenmeyer flask by adding 20mL of deionized water and 5.00 mL of 6M HCl. I then boiled the samples for about 2 minutes and allowed them to cool. After adding 4 drops of Phenolphthalein to each sample, they were ready for titration.

The addition of HCl to the antacid will simulate the reactions that are taking place inside your stomach as the tablet works to consume excess acids. The brief heating of the solution will ensure that the $CaCO_3$ has fully reacted.

The chemical reaction is:

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

Data

NaOH Standardization:

Trial #	Mass KHP (g)	Volume NaOH (mL)
1	1.0006±.0002	8.6±0.05
2	1.0016±.0002	8.3±0.05
3	1.0067±.0002	8.4±0.05

Sample Analysis:

Sample #	Mass of Tablet (g)	Volume NaOH (mL)
1	1.2094±.0002	31.1±0.05
2	1.2213±.0002	32.0±0.05
3	1.1906±.0002	32.1±0.05

Results and Error Analysis

NaOH Molarities:

Trial #	[NaOH] (mol/L)
1	0.570±.01
2	0.591±.01
3	0.587±.01

Average Molarity = 0.583 mol/L

Calculations:

①Mol $HCl_{INITIAL}$ – Mol HCl_{EXCESS} = **Mol $HCl_{REACTED}$**

② Calculate moles of $CaCO_3$ from Mol $HCl_{REACTED}$

③ From moles $CaCO_3$, determine mass of tablet in mg.

Sample #	Moles of $HCl_{REACTED}$	Mass $CaCO_3$ Per tablet (mg)
1	.0119±.0004	594±20
2	.0113±.0004	568±20
3	.0113±.0004	565±20

Mass of $CaCO_3$ Per Tablet = 590 ± 20 mg

95% Confidence Interval = 580 ± 40 mg $CaCO_3$