

N5. DETERMINATION OF CALCIUM CARBONATE IN TOOTHPASTE

PURPOSE: To determine the carbonate concentration of toothpaste

PREWORK

- Write the equations for sodium hydroxide and hydrochloric acid and calcium carbonate with hydrochloric acid.
- Assuming your sample is 100% w/w CaCO_3 , calculate the mass of toothpaste required to give a 25 mL back titration with 0.1 M NaOH, after the sample is dissolved in 50 mL of 0.1M HCl.

PROCEDURE

1. Obtain a toothpaste sample and check its approximate CaCO_3 content with your teacher. If it varies from the 100% used in the Prework, alter the mass of toothpaste to be weighed out by multiplying the calculated mass by (100/actual value)
2. Weigh out accurately about the required amount of toothpaste directly into three 250 mL conical flasks
3. Pipette 50 mL of standardised 0.1M HCl into each flask and gently boil the flasks on a hotplate for 5 minutes.
4. Cool the flasks to room temperature, add 1-2 drops of phenolphthalein and titrate with standardised 0.1M NaOH

CALCULATIONS

Treat each titration separately ie only average the final analysis value

1. Calculate the number of moles of HCl initially pipetted into the flasks
2. Calculate the number of moles of NaOH used in the back titration
3. Determine the moles of HCl remaining after dissolution of the toothpaste
4. Calculate the number of moles of HCl that reacted with CaCO_3
5. Using the reaction ratio, calculate the number of moles of CaCO_3 present in the sample
6. Calculate the mass of CaCO_3 present in the sample
7. Calculate the % w/w CaCO_3 in the sample
8. Calculate the average % and the relative precision of your results

DISCUSSION

- Explain the need for boiling the solution before titration
- Comment on the choice of back titration for this analysis
- Compare the accuracy of back titration to direct titration

QUESTIONS

1. Why is calcium carbonate used in toothpaste?
2. What are the other components of a typical toothpaste?

Acid Base Lab Determination Of CaCO_3 In Toothpaste

Michael Rajnik



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