

CHEMISTRY PROJECT

TOOTHPASTE ANALYSIS

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AIM

To detect the presence of different anions and cations in different brands of toothpaste and determine its quality.

MATERIALS REQUIRED

Toothpaste(s):

- . Colgate
- . Close-Up

Chemicals:

- . Dilute Hydrochloric acid
- . Concentrated Sulfuric acid
- . Concentrated Nitric acid
- . Concentrated Hydrochloric acid
- . Barium chloride
- . Sodium hydroxide
- . Sodium carbonate
- . Silver nitrate
- . Ammonium chloride
- . Ammonium hydroxide
- . Disodium hydrogen phosphate
- . Ammonium molybdate
- . Ammonium carbonate
- . Dilute Sulfuric acid
- . H₂S gas

THEORY

There's a wide variety of toothpastes and related products available today in the market for oral hygiene. However, for a common man, differentiation on the basis of quality is really difficult with all the fancy advertisements and offers. A toothpaste contains a mildly abrasive substance such as calcium carbonate and a detergent or soap, some sweetening agent other than sugar and flavouring oils to make it pleasant to taste and smell. Some toothpastes contain fluorides which make the enamel surface of the tooth more resistant to bacterial activity and act against microorganisms as a metabolic poison. Generally, any standard toothpaste contains calcium carbonate, sodium monofluoro phosphate, sodium lauryl sulphate, zinc sulphate, alum, some flavouring oils are also added.

This project basically deals with the detection of various ions in toothpaste that determine its quality and thus, a comparison between the prominent toothpaste brands.

CONCLUSION

Ions present in COLGATE are:

CO_3^{2-} , SO_4^{2-} , PO_4^{3-} , NH_4^+ , Mg^{2+} , Ca^{2+}

Ions present in CLOSE-UP are:

SO_3^{2-} , NH_4^+ , Ca^{2+}

More number of ions are found to be present in Colgate paste than in Close-Up paste.

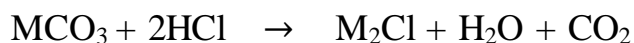
Hence, after testing different samples of toothpaste, we find that Colgate has all necessary ions for stronger and whiter teeth.

PRECAUTIONS

1. Handle the chemicals carefully.
2. Use test tube holder to hold the test tube.
3. Never add water to concentrated acids.
4. Never touch any chemicals with hands directly.
5. Use a dropper for concentrated acids.
6. Don't smell the vapour from too close.

COLGATE

EXPERIMENTS	OBSERVATIONS	INFERENCES
1. A little of the paste solution is added to about 1ml of dil. HCl.	Brisk effervescence with the liberation of colourless odourless gas.	Presence of carbonate.

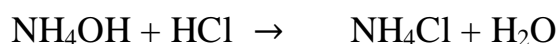
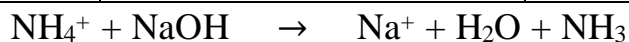


2. To a little of the paste solution, Barium Chloride solution is added.	White precipitate. Insoluble in dil. HCl.	Presence of sulphate.
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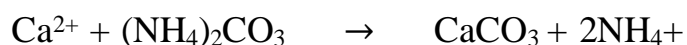
3. A small amount of the sample is acidified with Conc. HNO ₃ to which a little ammonium molybdate is added.	A bright yellow precipitate is formed.	Presence of Phosphate.
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4. To a little of the paste solution, Na ₂ CO ₃ solution is added.	Soluble and no precipitate is formed.	Ammonium may be present.
Treat a little of the paste solution with NaOH solution and warm.	Colourless pungent smelling gas is evolved which gives dense white fumes with con. HCl.	Presence of ammonium.

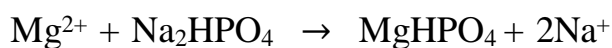


5. A little of the paste is made into a paste with con. HCl and is shown to non-luminous flame.	Brick red colour.	Ca ²⁺ may be present.
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A little of the paste solution is saturated with solid NH_4Cl , NH_4OH solution, followed by $(\text{NH}_4)_2\text{CO}_3$ solution.	White precipitate.	Presence of Ca^{2+}
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6. Add NH_4Cl , NH_4OH and Na_2HPO_4 solutions and rub the sides of the test tube with a glass rod.	White precipitate.	Presence of Mg^{2+}
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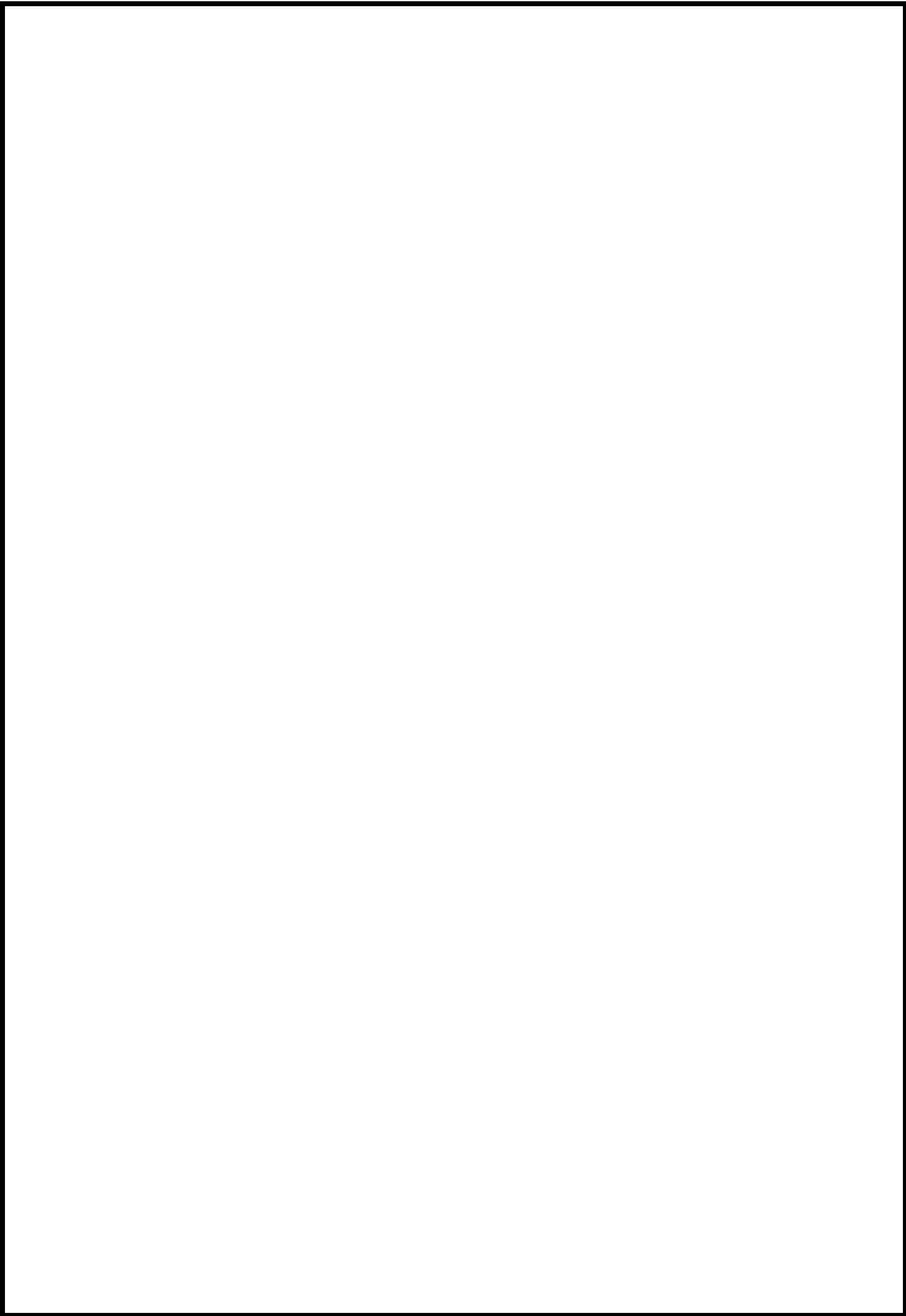
7. A little of the paste solution is rubbed with dil. H_2SO_4 and the smell is noted.	No vinegar smell.	Absence of acetate.
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8. A little paste is heated with a few drops of con. H_2SO_4 .	No characteristic reaction.	Absence of chloride.
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9. To a little of the paste solution add dil. HCl .	No white precipitate.	Absence of Pb^{2+}
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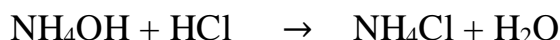
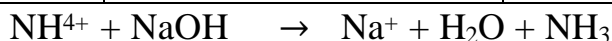
10. Pass H_2S gas through the above test tube.	No black precipitate.	Absence of Cu^{2+}
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11. A little of the paste solution is saturated with solid NH_4Cl followed by NH_4OH solution.	No white gelatinous precipitate.	Absence of Al^{3+}
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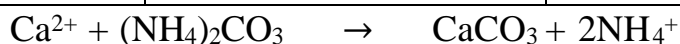


CLOSE-UP

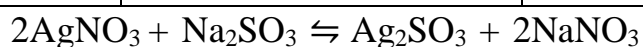
EXPERIMENTS	OBSERVATIONS	INFERENCES
Treat a little of the solution with NaOH solution and warm.	Colourless pungent smelling gas is evolved which gives dense white fumes with con.HCl.	Presence of ammonium.



2. A little of the paste is made into paste with con.HCl and is shown to non-luminous flame.	Brick red colour.	Ca^{2+} may be present
A little of the paste solution is saturated with solid NH_4Cl , NH_4OH solution, followed by $(\text{NH}_4)_2\text{CO}_3$ solution.	White precipitate.	Presence of Ca^{2+}



3. Add silver nitrate solution to the paste solution.	A white precipitate formed turns black when heated.	Presence of sulphite
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4. A little of the paste solution is added to about 1ml of dil. HCl.	No brisk effervescence.	Absence of carbonate
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5. To a little of the paste solution, Barium Chloride solution is added.	No white precipitate.	Absence of sulphate
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6. Add NH_4Cl , NH_4OH and Na_2HPO_4 solutions and rub the sides of the test tube with glass rod.	No characteristic precipitate.	Absence of Mg^{2+}
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7. A small amount of the sample is acidified with Conc. HNO_3 to which a little ammonium molybdate is added.	No characteristic reaction.	Absence of phosphate.
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8. A little paste is heated with a few drops of con. H_2SO_4 .	No characteristic reaction.	Absence of chloride.
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BIBLIOGRAPHY

- * <https://www.scribd.com/document/423235841/Chemistry-investigatory-project-XII-on-toothpaste-analysis>
- * <https://www.slideshare.net/slideshow/analysisoftoothpaste-1pdf/258448052>
- * Scheme of systematic analysis of cations and anions.