

# Comparative analysis of eggshell's calcium carbonate content collected from home and shop

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## ARTICLE DETAILS

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## ABSTRACT

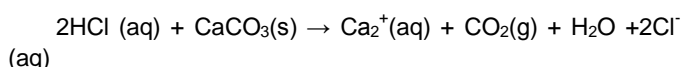
One of the most common sources of calcium is the egg shells and they are about 90% absorbable. The present research work was intended to decide the measure of calcium carbonate that present in eggshell. In this work, the comparative investigation of calcium carbonate content was done for eggshell of hen from house and shops by utilizing titration analysis. The result obtained shows that Hen eggshell from home contained 92.92% and 92.58%, while the egg shell from shops contained 97.83% and 96.67%. The author outlined the finding that eggshell from shops is the best source of calcium when contrast with others.

## 1. Introduction

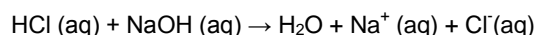
Eggshell is the hard outside spread that ensures the posterity of oviparous living beings. It contains around 98.2% Calcium carbonate, 0.9% Magnesium and 0.9% Phosphorous (phosphate). Despite the fact that the shells are hard, they have pores which sufficiently enable oxygen to enter the egg and carbon dioxide to leave. The calcareous eggshell likewise shields the egg substance from the microbial condition. The shell gives an outside assurance from mechanical harm and tainting while egg whites (egg white) pads and ensures the creating developing life. For the nascent life form, the egg white fills in as a rich source of protein and water. Compound investigations showed that, eggshell is made out of about 97% calcium carbonate, and most of the investigation on shell quality concentrated on this reality (Hunton, 2005).

Admission of fine powdered eggshell can be utilized as a solution for those experiencing osteoporosis. Eggshell membrane powder can be used in paper industry. It very well may be utilized as lime or calcium supplement in cultivating. Eggshell layer is utilized for the creation of biodegradable plastic. Pulverized eggshell can be utilized in fighting off hungry herbivorous slugs and snail without utilizing dangerous pesticide. In different nations, it is an adequate practice for egg shells to be dried and utilized as a source of calcium in pet feed.

Calcium Carbonate (CaCO<sub>3</sub>) estimation is done by titrimetric analysis. Calcium Carbonate (limestone) in pure water is insoluble yet will speedily separate in acid as per the accompanying reaction



As this response is slow, it can't be utilized specifically to titrate CaCO<sub>3</sub>. Rather addition of excess acid to break down the majority of the CaCO<sub>3</sub> and then titrating the remaining H<sub>3</sub>O<sup>+</sup> with NaOH solution gives the measure of corrosive which has not responded with the calcium carbonate. The difference between the measures of the acid (HCl) first included and the sum left over after the response was equal to the sum utilized by the CaCO<sub>3</sub>. The reaction used to determine the leftover acid is



The aim of present research work is to determine the amount of calcium carbonate that occurs in eggshell.

## 2. Materials and Methods

### 2.1. Sample Collection

Eggs of hen were brought from house (2) and shops (2) and their shells were collected. The collected egg shell samples were labelled accordingly.

| Egg samples            | Label    |
|------------------------|----------|
| Egg shell from house 1 | Sample 1 |
| Egg shell from house 2 | Sample 2 |
| Egg shell from shop 1  | Sample 3 |
| Egg shell from shop 2  | Sample 4 |

### 2.2. Methodology

1. Eggshells collected were cleaned with water and dried in oven overnight at about 110 °C.
2. The eggshells were then powdered using a mortar and pestle. Using an electronic balance, 0.2 g of this powdered eggshell is accurately weighted.
3. The measured eggshell powder is put it into 250 ml conical flask. 0.1987 M HCL of 25 ml is pipetted out. It is boiled for 15 minutes and was allowed to cool down. A few amount of about 5ml ethanol was also added to the flask.
4. A few drop of phenolphthalein is added to the solution using a dropper. This solution is titrated with 0.1 M NaOH solution which was taken in the burette.
5. End point is read with the appearance of pink colour and volume reading was noted down. In order to get conformable values, titration was repeated several times.
6. The value obtained is used in the formula to calculate the amount of CaCO<sub>3</sub> present in eggshell.
7. The formula used for calculation is:

Percentage of  $\text{CaCO}_3$  present in eggshell = (The weight of  $\text{CaCO}_3$  / Weight of egg shell taken)\*100

### 1. Observation

The observations for the titrimetric analysis are summarized in following Tables.

**Table-2**  
Titrimetric analysis of hen egg shell sample 1

| Burette Reading     | First | Second | Third |
|---------------------|-------|--------|-------|
| Initial Reading     | 0     | 0      | 0     |
| Final Reading       | 12.5  | 12.4   | 12.4  |
| Volume of NaOH used | 12.5  | 12.4   | 12.4  |

Average volume of NaOH used =  $(12.5 + 12.4 + 12.4)/3 = 12.43 \text{ cm}^3$

|   |                    |
|---|--------------------|
| Number of moles of NaOH used to react with HCl            | $1.24 \times 10^3$ |
| Since number of moles of NaOH = number of moles of HCl    | $1.24 \times 10^3$ |
| The initial no of moles of HCl: volume X molarity         | $4.96 \times 10^3$ |
| Number of moles of HCl used to react with $\text{CaCO}_3$ | $3.72 \times 10^3$ |
| Number of moles of $\text{CaCO}_3$ reacted                | $1.86 \times 10^3$ |
| The weight of $\text{CaCO}_3$                             | 0.186              |
| The % of $\text{CaCO}_3$ in eggshell                      | 92.92%             |

**Table-3**  
Titrimetric analysis of hen egg shell sample 2

| Burette Reading     | First | Second | Third |
|---------------------|-------|--------|-------|
| Initial Reading     | 0     | 0      | 0     |
| Final Reading       | 12.6  | 12.6   | 12.5  |
| Volume of NaOH used | 12.6  | 12.6   | 12.5  |

Average volume of NaOH used =  $(12.6 + 12.6 + 12.5)/3 = 12.6 \text{ cm}^3$

|   |                    |
|---|--------------------|
| Number of moles of NaOH used to react with HCl            | $1.26 \times 10^3$ |
| Since number of moles of NaOH = number of moles of HCl    | $1.26 \times 10^3$ |
| The initial no of moles of HCl: volume X molarity         | $4.96 \times 10^3$ |
| Number of moles of HCl used to react with $\text{CaCO}_3$ | $3.7 \times 10^3$  |
| Number of moles of $\text{CaCO}_3$ reacted                | $1.85 \times 10^3$ |
| The weight of $\text{CaCO}_3$                             | 0.185              |
| The % of $\text{CaCO}_3$ in eggshell                      | 92.58%             |

**Table-4**  
Titrimetric analysis of hen egg shell sample 3

| Burette Reading     | First | Second | Third |
|---------------------|-------|--------|-------|
| Initial Reading     | 0     | 0      | 0     |
| Final Reading       | 10.5  | 10.4   | 10.5  |
| Volume of NaOH used | 10.5  | 10.4   | 10.5  |

Average volume of NaOH used =  $(10.5 + 10.4 + 10.5)/3 = 10.5 \text{ cm}^3$

|   |                    |
|---|--------------------|
| Number of moles of NaOH used to react with HCl            | $1.05 \times 10^3$ |
| Since number of moles of NaOH = number of moles of HCl    | $1.05 \times 10^3$ |
| The initial no of moles of HCl: volume X molarity         | $4.96 \times 10^3$ |
| Number of moles of HCl used to react with $\text{CaCO}_3$ | $3.91 \times 10^3$ |
| Number of moles of $\text{CaCO}_3$ reacted                | $1.96 \times 10^3$ |
| The weight of $\text{CaCO}_3$                             | 0.196              |
| The % of $\text{CaCO}_3$ in eggshell                      | 97.83%             |

**Table-5**  
Titrimetric analysis of hen egg shell sample 4

| Burette Reading     | First | Second | Third |
|---------------------|-------|--------|-------|
| Initial Reading     | 0     | 0      | 0     |
| Final Reading       | 11.1  | 10.8   | 10.9  |
| Volume of NaOH used | 11.1  | 10.8   | 10.9  |

Average volume of NaOH used =  $(11.1 + 10.8 + 10.9)/3 = 10.93 \text{ cm}^3$

|   |                    |
|---|--------------------|
| Number of moles of NaOH used to react with HCl            | $1.09 \times 10^3$ |
| Since number of moles of NaOH = number of moles of HCl    | $1.09 \times 10^3$ |
| The initial no of moles of HCl: volume X molarity         | $4.96 \times 10^3$ |
| Number of moles of HCl used to react with $\text{CaCO}_3$ | $3.87 \times 10^3$ |
| Number of moles of $\text{CaCO}_3$ reacted                | $1.93 \times 10^3$ |
| The weight of $\text{CaCO}_3$                             | 0.193              |
| The % of $\text{CaCO}_3$ in eggshell                      | 96.67%             |

### 2. Result and Discussion

Present study attempted to find the calcium carbonate content in the egg shells. Egg shells of hen were brought from market and from house. Titrimetric analysis carried out to find the calcium carbonate content of the egg shells. Sample 3 showed high content of calcium carbonate while Sample 2 the least.

Sample 3 > Sample 4 > Sample 1 > Sample 2

Present experimental result is shown in Table- 6

**Table-6**  
Percentage of  $\text{CaCO}_3$  present in different eggshell samples

| Egg samples | The % of $\text{CaCO}_3$ in Eggshell |
|-------------|--------------------------------------|
| Sample 1    | 92.92                                |
| Sample 2    | 92.58                                |
| Sample 3    | 97.83                                |
| Sample 4    | 96.67                                |

### 3. Conclusion

Egg shell assumes an inescapable job in the life of an oviparous creature. Calcium is basic to reproducing winged creatures and is required in extensive sums for egg shell generation and for the sound development of the youthful chicks. In its nonappearance, winged animals can be heartbreaking, deformed or even fail miserably. In the hen,

calcium lack amid the reproducing time frame results in poor egg shell arrangement and even to egg-binding. Giving extra calcium to fowls in the midst of the raising and advancement season is thus unequivocally recommended. Sufficient calcium ensures incredible egg shell game plan and the progression of a strong skeleton.

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