Gravimetric Analysis

**Title:** Finding the purity of NaCl by gravimetric analysis with AgNO3

**Principle of Gravimetric Analysis:**

**Materials Supplied.**

(a). 0.2 g of NaCl in 100 mL of DW;

(b). 500 mL of 5% w/v of AgNO3 solution in Deionized/Distilled water with 2-3 drops of HNO3;

(c).Diluted HNO3 (6 N)

**Theory:**

The following reaction forms the basis for the calculation of the theoretical amount of AgNO3 solution required as well as the purity of the given NaCl.

$$AgNO\_{3}\left(169.87 g\right)+NaCl \left(58.44 g\right) \rightarrow AgCl\downright \left(143.22 g\right)+NaNO\_{3}(84.99 g)$$

Therefore,

$$NaCl ≡AgNO\_{3}$$

or, 1 g of NaCl = 169.87/ 58.44 = 2.9067 g of AgNO3

or, 1 g of AgCl = 58.44/143.22 = 0.4078 g of NaCl (This is the ‘Gravimetric Factor (F) ’ for this reaction)

Consequently, the percentage of purity is determined from the formula,

$$\% of Purity= \frac{W×F×100}{S}$$

Where,

W = Wt. of the product obtained by reacting with the chemical to be determined.

F = Gravimetric factor and,

S = Wt. of the sample (whose purity has to be determined) taken.

**Procedure:**

1. Take the NaCl solution and add 1 mL of dilute HNO3 dropwise with constant stirring. Check the pH of the solution using blue litmus to maintain an acidic condition.
2. Calculate the amount of AgNO3 solution required for 100 % pure of 0.2 g NaCl and take 5% AgNO3 solution a little excess of that.
3. Add 5 mL of the solution to NaCl solution at a time and add rest of the solution slowly dropwise with constant stirring with a glass rod.
4. Now cover the beaker with a watch glass and boil the content very gently with occasional stirring to avoid volume loss due to bumping of liquid.
5. Stop heating and digest the solution for 10 minutes so as to agglomerate the precipitate and enhance settling thereby leaving a clear supernatant.
6. Add 2 drops of AgNO3 to the supernatant carefully to check for complete removal fo Cl- ions from solution.
7. Avoid sunlight as much possible during the time of settling.
8. Take a Gooch Crucible and heat it till a constant weight is obtained. Note the reading.
9. Now fix the crucible into a suction flask and decant the supernatant carefully with gentle suction. Transfer the precipitate to the crucible. For complete transfer, wash the beaker with 15 mL of 0.01 N HNO3 for thrice and pour the solution each time to crucible.
10. Wash the crucible atleast for thrice with DW to remove excess of AgNO3 and HNO3.
11. Apply vigorous suction to drain out the water from the ppt as much water possible.
12. Dry the crucible to a constant weight at 110-120 C and get at least two concurrent weighing’s.
13. Now Calculate the weight of the precipitate and from there the purity of NaCl in %.

**Precautions:**

1. Solution is acidified with HNO3 to dissolve the substances that are otherwise not soluble in water, e.g., CO32-, PO43- etc.
2. HNO3 also helps to coagulate any colloidal AgCl.
3. Excess of HNO3 must be avoided to cause the solvolysis of Ag-halides.
4. Heating should be done only after complete addition of AgNO3, otherwise Cl2 may form and liberate from solution.

$$NaCl+HNO3 \rightarrow HCl+NaNO3$$

$$6HCl+HNO3 \rightarrow 3Cl\_{2}\uparrow +4 H2O+NO $$

1. The experiment should be carried out preferentially in absence of srong sunlight as sunlight may decompose AgCl and form Cl2.
2. AgCl is significantly volatile, thus avoid drying at higher temperatures.