

Experiment. 3

Water turbidity Determination by Cation Exchanger

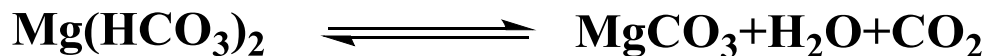
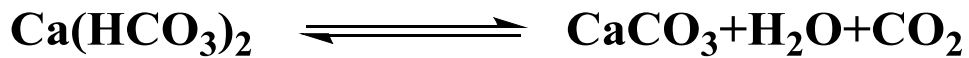
The theoretical part

In the beginning we need to know what water turbidity, it is formed in the water by the presence of the calcium and magnesium salts dissolved in water and sometimes in the presence of the iron salts in water.

Two kinds of the water turbidity can be distinguished depending on the nature of the dissolved salts in water:

1. Temporary turbidity

It is formed in the water as a result of the containing this water on $\text{Ca}(\text{HCO}_3)_2$, $\text{Mg}(\text{HCO}_3)_2$ or both of them, these salts are decomposed when heating the water turbidity to the boiling point so it cause to form CaCO_3 and MgCO_3 , at a result of that the temporary turbidity will be gone that known as a carbonate turbidity.



2. Permanent turbidity

This is produced by the presence of the sulfate, calcium chloride and magnesium chloride dissolved in water. This turbidity cannot be removed by boiling. When the water (for example, tap water) is passed on a cation exchanger as a (H^+ - Form), the dissolved cations in the water turbidity that containing (calcium and magnesium ions) will be exchange with the hydrogen ions in the exchanger. the solution will be acids of the anions dissolved in the water. The amount of the exchange hydrogen ions can be calculated by titration the acid with a standard solution of NaOH using the methyl orange indicator.

Industrial Applications

The ion exchange columns are widely used in the industry for the purpose of obtaining deionized water. The method is to passes the ordinary water in a strong cation column (H^+ - Form), The water exited from this column is free from cations but it contains anions and hydrogen ion(acid). Then, acidic water should be passes through another separated strong anionic column as a (OH^- - Form). When water passes in this column, an exchange between the anions and the hydroxyl group (OH) will occur. The anions remain on the column resin and the hydroxyl group goes to the water, Water now contains hydrogen ion and hydroxyl ion and is free of cations and anions.

The amount of cations and anions in the prepared water in this method is much less than the amount of ions contained in the water prepared by water evaporation and condensation using regular fumigants. The resin which used in this method can be reused after activated in the normal method.

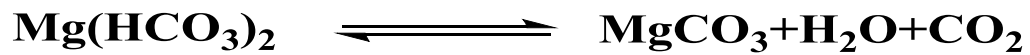
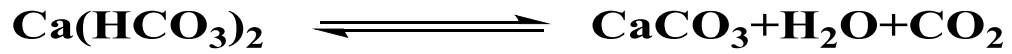
Materials

1. HCl hydrochloric acid (3N)
2. AgNO₃ silver nitrate (0.1 N)
- 3 – NaCl sodium chloride
- 4 – Methyl orange
- 5 – NaOH
- 6- Turbidity water

Procedure

1. Reactivate the column by HCl.
2. Wash the column with distilled water until it becomes neutral.
3. Take from the turbidity water measured by the pipette in a clean beaker.
4. Step by step, transfer this water quantitatively to the ion exchanger column.
5. Wash the beaker several times with distilled water and pass the wash water to the ion exchanger column.
6. Collect the water from the column in a conical flask and will be pink color after being detected by the methyl orange indicator and then titrate it with the standard solution of sodium hydroxide.

Calculation



$$\frac{N (\text{NaOH}) \times V (\text{NaOH})}{1000} = \frac{\text{Wt CaCO}_3}{\text{Eq. Wt CaCO}_3}$$

Discussion questions

1. What are other methods to remove the turbidity? compare between them
2. What is water turbidity?
3. What is the reason of presence of the turbidity and what is the types of it?
4. What are the most phenomenans of turbidity water?
5. How to obtain deionized water? what is the type of the exchanger used? write the equations?