

Experiment No. (3)

Aluminum (III) Potassium Sulfate Dodecahydrate

Potassium alum, potash alum, tawas, or potassium aluminum sulfate is a chemical compound: the potassium double sulfate of aluminum. Its chemical formula is $\text{KAl}(\text{SO}_4)_2$, and it is commonly found in its dodecahydrate form as $\text{KAl}(\text{SO}_4)_2 \cdot 12(\text{H}_2\text{O})$. Alum is the common name of this chemical compound, given the nomenclature of potassium aluminum sulfate dodecahydrate. It is commonly used in water purification, leather tanning, dyeing, fireproof textiles, and baking powder. It also has cosmetic uses as a deodorant, as an aftershave treatment and as a styptic for minor bleeding from shaving.

Potassium alum crystallizes in regular octahedra with flattened corners, and is very soluble in water. The solution reddens litmus and is an astringent. When heated to nearly a red heat it gives a porous, friable mass, which is known as "burnt alum". It fuses at 92°C (198°F) in its own water of crystallization. "Neutral alum" is obtained by the addition of as much sodium carbonate to a solution of alum as will begin to cause the separation of alumina.



Potassium Alum Crystal with Unequal Distribution of the Octahedral Face Area

PROPERTIES AND USES

- ◆ It is white crystalline solid.
- ◆ It is soluble in water.
- ◆ It is used for the purification of water.
- ◆ It is also used in leather industry and in paper industry.
- ◆ It is used in fire extinguisher.
- ◆ Melting point is 92°C

Types of Alum

- Potassium aluminum sulfate $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$
- Sodium aluminum sulfate $\text{NaAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$,

The Required Reagents

25ml of Sodium Carbonate (0.5M).

0.72g of calcium hydroxide.

Distilled water.

Phenolphthalein as indicator 2-3 drops.

Hydrochloric acid (HCl 0.1M).

Procedure

- 1- Add 0.72g of Calcium Hydroxide to 25ml of Sodium Carbonate (0.5M) in a small beaker
- 2- Mark the level of mixture in the beaker then heat it for 10 minute
- 3- Add 25ml of Distilled water to the mixture
- 4- Turn the mixture to graduated cylinder (100ml) and record the height of precipitate column in different times from the time of transferring mixture to the cylinder (1,2,3,4,6,8) minute .leave the mixture to the next laboratory
- 5- Take 10ml of filtrate solution by using pipette to the conical flask then add 2-3 drops of Phenolphthalein as indicator and then titrate against the standard solution Hydrochloric acid (HCl 0.1M).
- 6- Record volume downward from the acid at the end point. and re-experiment to get two readings close

Questions

- 1- Write the balance equation of this reaction?
- 2- Draw a graph between height of precipitate column against times?
- 3- Give the reason why the mixture leaves to the next laboratory with cover it ?
- 4- Prepare 0.1M standard solution Hydrochloric acid?
- 5- Calculate the concentration of sodium hydroxide?
- 6- Give the percentage of yield?
- 7- Prepare 0.5M of Sodium Carbonate?