

# CH1019 Chemical Process Technology

## Lecture 4c

### Chapter 3 Fertilizer Industries

Balasubramanian S

Assistant Professor (OG)

Department of Chemical Engineering



# Overview of topics

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## Chapter 3 FERTILIZER INDUSTRIES

- 1 Nitrogen industries
- 2 Phosphorous industries
- 3 Potassium industries



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# Fertilizer industries – Potassium

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The word potash has come from the fact that extraction of wood ashes with water produces a  $\text{KOH-K}_2\text{CO}_3$  solution.

Metallic potassium was first prepared by electrolysis of fused  $\text{KOH}$ .

The largest domestic production of potassium salts has come from deep Permian sedimentary deposits of sylvinite.



# Fertilizer industries – Potassium

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The major products associated with potassium are:

1. Potassium chloride
2. Potassium sulfate
3. Potassium bisulfate
4. Potassium hydroxide
5. Potassium carbonate
6. Potassium bromide
7. Potassium iodide
8. Potassium nitrate
9. Potassium permanganate
10. Potassium dichromate



# Fertilizer industries – Potassium

**Potassium chloride** - The chemical compound **potassium chloride (KCl)** is a metal halide salt composed of potassium and chloride.

- It is **odorless and has a white or colorless vitreous crystal** appearance.
- The solid **dissolves readily in water** and its solutions have **a salt-like taste**.
- KCl is used in **medicine, food processing**, and used to **cause cardiac** arrest as the third drug in the "**three drug cocktail**" for executions by lethal injection.
- It occurs naturally as the **mineral sylvite** and in combination with **sodium chloride as sylvinite**.



# Fertilizer industries – Potassium

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## Potassium chloride Uses:

- The majority of the potassium chloride produced is used for making fertilizer.
- As a chemical feedstock, it is used for the manufacture of potassium hydroxide and potassium metal.
- Potassium chloride is used in some de-icing products that are designed to be safer for pets and plants.



# Fertilizer industries – Potassium

## Potassium sulfate:

- **Potassium sulfate ( $K_2SO_4$ )** also called **sulphate of potash**, is a non-flammable white crystalline salt which is soluble in water. The chemical compound is commonly used in fertilizers, providing both potassium and sulfur.
- The mineral form of potassium sulfate, arcanite, is relatively rare. Natural resources of potassium sulfate are minerals abundant in the Stassfurt salt.





# Fertilizer industries – Potassium

## Potassium sulfate:

- The dominant use of potassium sulfate is as a fertilizer.
- $K_2SO_4$  does not contain chloride, which can be harmful to some crops. Potassium sulfate is preferred for these crops, which include tobacco and some fruits and vegetables.
- Crops that are less sensitive may still require potassium sulfate for optimal growth if the soil accumulates chloride from irrigation water.
- The crude salt is also used occasionally in the manufacture of glass. Potassium sulfate is also used as a flash reducer in artillery propellant charges.



# Sulfur Industries

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## References

1. Dryden C. E, *Outlines of Chemical technology – for the 21<sup>st</sup> Century*, 3<sup>rd</sup> edition, East-West Press (2004)
2. Austin G. T, *Shreve's Chemical Process Industries*, 5<sup>th</sup> edition, Mc Graw Hill International editions (1984)