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PHARMACEUTICAL INORGANIC CHEMISTRY

UNIT 4

TOPIC :

- **Astringents : Zinc Sulphate, Potash Alum**



ASTRINGENTS

- Astringents are chemical substances that cause the contraction or shrinkage of body tissues, especially the mucous membranes and skin, by precipitating proteins on the surface.
- They reduce secretions, inflammation, and bleeding, and are often used for local application.

Mechanism of Action

- Astringents precipitate proteins present on the surface of tissues.
- This results in the formation of a protective layer that:
 - Reduces inflammation
 - Protects underlying tissue
 - Contracts blood vessels (vasoconstriction)
 - Decreases capillary permeability
 - Reduces local secretions and bleeding

Classification of Astringents

1. Metallic Astringents

- Contain metal ions like aluminium or zinc that bind with proteins.
- Eg : Zinc Oxide, Potash Alum, etc

2. Vegetable Astringents

- Contain tannins or phenolic compounds that precipitate proteins.
- Eg : Tannic Acid, Catechu, etc

3. Miscellaneous Astringents

- Used in various pharmaceutical and cosmetic products.
- Eg : Alcohol (70%), Saline Water, etc

Uses of Astringents

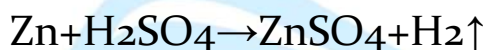
1. To Stop Minor Bleeding
 - After shaving, small cuts, or dental procedures
 - Example: Alum sticks
2. As Anti-inflammatory Agents
 - In treatment of skin inflammations, eczema, or dermatitis
3. In Mouth and Throat Preparations
 - For gargles, lozenges, and mouthwashes
 - Relieves sore throat and swollen gums
4. In Eye Drops and Lotions
 - Reduces conjunctival swelling
 - Example: Zinc sulphate eye drops
5. In Cosmetics and Skin Care
 - Tightens pores, removes excess oil
 - Found in toners, face masks, and aftershave lotions
6. In Diarrhea Treatment
 - Some vegetable astringents (like tannic acid) reduce intestinal secretions

ZINC SULPHATE

- Chemical Formula : $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ (Heptahydrate form)
- Molecular Weight : 287.5 g/mol
- Synonyms : White Vitriol, Zincum Sulfuricum

Method of Preparation

- Zinc sulphate can be prepared by the reaction of zinc metal or zinc oxide with dilute sulphuric acid (H_2SO_4):



Physical Properties

- Appears as white crystalline powder or transparent colorless crystals
- Odourless
- Has astringent and metallic taste
- Soluble in water
- Insoluble in alcohol
- Efflorescent on exposure to air (loses water of crystallization)

Chemical Properties

Decomposition :

On strong heating, zinc sulphate decomposes to zinc oxide, sulphur dioxide (SO_2) and oxygen.



Uses

1. As an Emetic (in older practice):
 - Induces vomiting in emergency poisoning cases (*Note: now rarely used due to better alternatives*)
2. As an Astringent and Mild Antiseptic:
 - Used in eye drops, lotions, and ointments
3. In Nutritional Supplements:
 - Provides zinc in deficiency disorders
 - Used in diarrhea management in children

POTASH ALUM

- Chemical Name : Potassium Aluminium Sulphate
- Chemical Formula : $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$
- Molecular Weight : 474.39 g/mol
- Synonyms : Alum, Fitkari (commonly in India), Potassium alum

Method of Preparation

- Potash alum is prepared by mixing aluminium sulphate and potassium sulphate in equimolar quantities in hot water and allowing the solution to crystallize:



Physical Properties

- Appears as large, colorless, transparent crystals
- Odourless
- Has astringent and sweetish taste
- Soluble in water, insoluble in alcohol
- On heating, it loses water of crystallization and swells up
- Turns powdery white on exposure to air (efflorescence)

Chemical Properties

Astringent Action:

- Causes contraction of body tissues, reduces bleeding and secretions.

Uses:

1. As an Astringent:
 - Used in minor cuts and shaving to stop bleeding
 - Used in gargles and mouthwashes for sore throat
2. As an Antiseptic:
 - Used in dusting powders and lotions to prevent infections
3. Water Purification:
 - Acts as a coagulant, removes suspended particles by flocculation
4. In Dyeing and Tanning:
 - Used as a mordant in fabric dyeing
 - Used in leather tanning