Physical properties :-

1. Tartaric acid is a colourless, crystalline solid.
2. It is soluble in water and alcohol but insoluble ether.
3. Melting point 170°C
4. Specific gravity 1.760.

Chemical properties :-

1. Reaction with metals :- Tartaric acid reacts wit metals to give two series of salts. acid and nor salts.

$$\begin{matrix} HO-CH-COOH \\ HO-CH-COOH \end{matrix} \xrightarrow{Na} \begin{matrix} HO-CH-COONa \\ HO-CH-COOH \end{matrix} - \frac{1}{2}H_2$$

Sod. hydrogentartarate

$$\begin{matrix} HO-CH- \\ HO-CH- \end{matrix} \xrightarrow{K} \begin{matrix} HO-CH- \\ HO-CH- \end{matrix} - \frac{1}{2}H_2$$

Sod. Pot. or, Rochelle S

2. Reaction with alcohol :- Tartaric acid reacts wi alcohol to form acid and normal ester.

$$\begin{matrix} HO-CH-COOH \\ HO-CH-COOH \end{matrix} \xrightarrow{C_2H_5OH} \begin{matrix} HO-CH-COOC_2H_5 \\ HO-CH-COOH \end{matrix} + H_2$$

Ethyl hydrogen tartarate

$$\begin{matrix} HO-CH-COOC_2H_5 \\ HO-CH-COOH \end{matrix} \xrightarrow{C_2H_5OH} \begin{matrix} HO-CH-COOC_2H_5 \\ HO-CH-COOC_2H_5 \end{matrix} +$$

Diethyl tartarate.

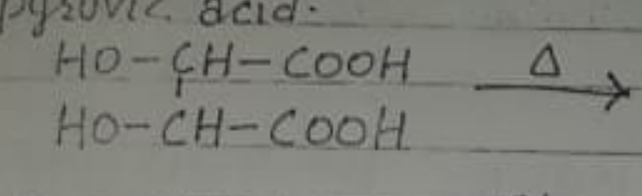
3. Reaction with ammonia :- Two mols. of amm reacts with tartaric acid to give ammonium sa after heating to give amide.

$$\begin{matrix} HO-CH-COOH \\ HO-CH-COOH \end{matrix} + \begin{matrix} NH_3 \\ NH_3 \end{matrix} \longrightarrow \begin{matrix} HO-CH-COONH_4 \\ HO-CH-COONH_4 \end{matrix}$$

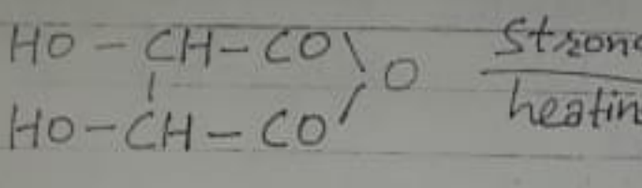
Ammonium tartar

$$\begin{matrix} HO-CH-COONH_4 \\ HO-CH-COONH_4 \end{matrix} \xrightarrow{\Delta} \begin{matrix} HO-CH-CONH_2 \\ HO-CH-CONH_2 \end{matrix} + 2H_2$$

4. Heating effect :- When tartaric acid is heated at to give anhydride. On strong heating they form pyruvic acid.

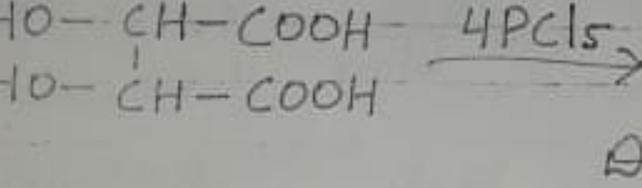


Tartaric anhydride



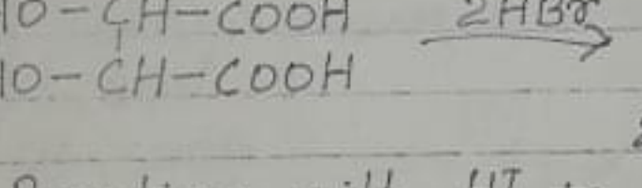
Pyruvic acid

5. Reaction with PCl_5 :- When tartaric acid reacts with PCl_5 to form dichloro succinyl chloride.



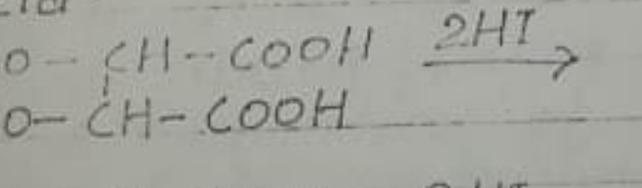
Dichloro succinyl chloride

6. Reaction with HBr :- When tartaric acid reacts with HBr to form 2,3- dibromo succinic acid

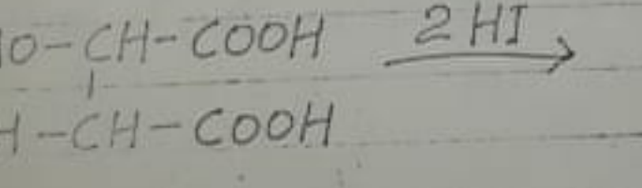


2,3- dibromo succinic acid

7. Reaction with HI :- When tartaric acid is reacted with HI it first form malic acid after then succinic acid.

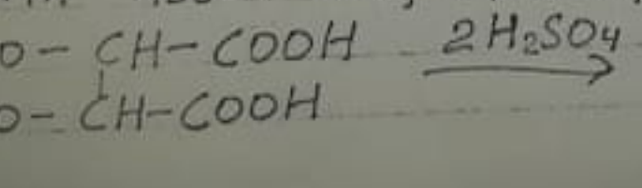


Malic acid



Succinic acid

8. Reaction with H_2SO_4 :- When tartaric acid reacts with H_2SO_4 they decompose into CO, CO_2 and SO_2



9. Acetylation :- Tartaric acid reacts with two mols. of acetyl chloride to give mono and di-acetyl tartaric acid.

$$HO-\underset{HO-CH-COOH}{\overset{|}{CH}}-COOH \xrightarrow{CH_3COCl} (CH_3COO)-\underset{HO-CH-COOH}{\overset{|}{CH}}-COOH + HCl$$

Mono acetyl tartaric acid

$$(CH_3COO)-\underset{HO-CH-COOH}{\overset{|}{CH}}-COOH \xrightarrow[-HCl]{CH_3COCl} (CH_3COO)-\underset{(CH_3COO)-CH-COOH}{\overset{|}{CH}}-COOH$$

Di-acetyl tartaric acid

10. Oxidation :- When tartaric acid oxidised with mild O.A to give tartronic acid while strong O.A like HNO_3 to give Oxalic acid.

$$HO-\underset{HO-CH-COOH}{\overset{|}{CH}}-COOH \xrightarrow[mild]{2[O]} HO-\underset{COOH}{\overset{|}{CH}}-COOH + H_2O + CO_2$$

Tartronic acid

$$HO-\underset{COOH}{\overset{|}{CH}}-COOH \xrightarrow[HNO_3]{2[O]} \underset{COOH}{\overset{|}{COOH}} + H_2O + CO_2$$

Oxalic acid

With Fenton's reagent it oxidised to give dihydroxy maleic acid.

$$HO-\underset{HO-CH-COOH}{\overset{|}{CH}}-COOH \xrightarrow[H_2O_2/Fe^{++}]{[O]} \begin{matrix} HO-C-COOH \\ \| \\ HO-C-COOH \end{matrix} + H_2O$$

Dihydroxy maleic acid.

Uses :- 1. It is used as a medicine.
2. Making of packing powder
3. Preparation of Fehling solution
4. Sodium potassium tartarate is making mirrors. also used for

Establish the structure of Tartaric acid.

1. By elemental analysis and molecular weight determination its molecular formula is $C_4H_6O_6$.

2. Tartaric acid gives effervescence with $NaHCO_3$ and form salt and ester two types. This indicates that presence of two carboxylic groups.

3. On heating it doesnot eliminate CO_2 but forms anhydride. This reaction reveals that both the carboxylic group attached with different C-atom.

4. Formation of dibromo or diacetyl derivatives indicates that presence of two alcoholic groups attached to two different C-atoms.

5. On the basis of for going facts we can say that the structure of tartaric acid is given as follows—