

Preparation of sodium aqua-(ethylenediaminetetraacetato)ferrate(III) dihydrate

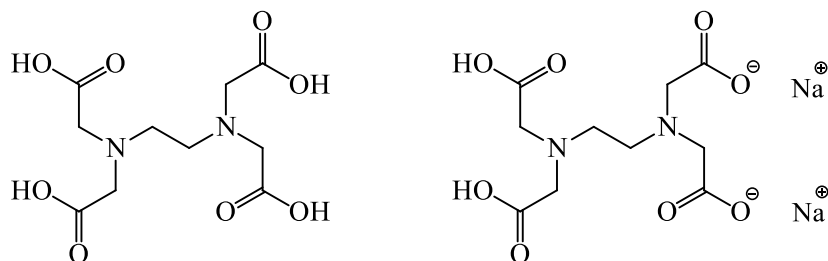


Fig. 1 Ethylenediaminetetraacetic acid H_4edta and its disodium salt $\text{Na}_2\text{H}_2\text{edta}$.

Ethylenediaminetetraacetate anion edta^{4-} is an important hexadentate ligand. It forms very stable chelate complexes with many metal cations. The edta^{4-} anion is coordinated to a central atom by four oxygen atoms and two nitrogen atoms (Fig. 2).

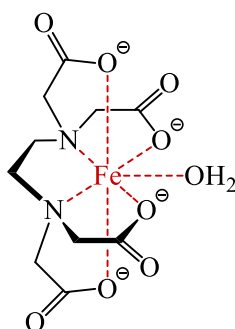
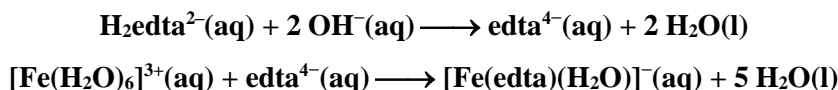


Fig. 2 Structure of the complex anion $[\text{Fe}(\text{edta})(\text{H}_2\text{O})]^-$.

Sodium aqua-(ethylenediaminetetraacetato)ferrate(III) dihydrate $\text{Na}[\text{Fe}(\text{edta})(\text{H}_2\text{O})] \cdot 2\text{H}_2\text{O}$ may be prepared by two-step synthesis from the disodium salt $\text{Na}_2\text{H}_2\text{edta}$.



Work

According to the procedure, prepare sodium aqua-(ethylenediaminetetraacetato)ferrate(III) dihydrate.

Chemicals

- sodium dihydrogen ethylenediaminetetraacetate dihydrate $\text{Na}_2\text{H}_2\text{edta} \cdot 2\text{H}_2\text{O}$, white crystalline substance,
- iron(III) chloride hexahydrate $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$, dark yellow hygroscopic crystalline substance,
- sodium hydroxide, NaOH , white granules or flakes.

Procedure

In a 100 cm^3 beaker dissolve $0,4 \text{ g}$ of NaOH in 10 cm^3 of water. Add $3,8 \text{ g}$ of $\text{Na}_2\text{H}_2\text{edta} \cdot 2\text{H}_2\text{O}$. Heat the mixture carefully until the solid substance dissolves. In a smaller beaker dissolve $2,5 \text{ g}$ of $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ in 5 cm^3 of water. Under continuous stirring, pour the prepared solution to the $\text{Na}_2\text{H}_2\text{edta}$ and NaOH solution. Evaporate water by moderate boiling until the most of substance is excluded from the solution. Then, cool the reaction mixture in an ice bath and filter on the Büchner funnel. Wash the product thoroughly with ice water to remove all iron(III) cations. Finally, wash the product twice with ethanol and dry it by filter papers at room temperature.

Safety instructions

Sodium dihydrogen ethylenediaminetetraacetate dihydrate – Na₂H₂edta·2H₂O

- R22** Harmful if swallowed.
- R36/37/38** Irritating to eyes, respiratory system and skin.
- S2** Keep out of the reach of children.
- S26** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S36** Wear suitable protective clothing.
- S46** If swallowed, seek medical advice immediately and show this container or label.

Iron(III) chloride hexahydrate – FeCl₃·6H₂O

- R22** Harmful if swallowed.
- R38** Irritating to skin.
- R41** Risk of serious damage to eyes.
- S26** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S39** Wear eye/face protection.

Sodium hydroxide – NaOH

- R34** Causes burns.
- S26** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S28** After contact with skin, wash immediately with plenty of (to be specified by the manufacturer).
- S45** In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).
- S36/37/39** Wear suitable protective clothing, gloves and eye/face protection.