

15.2 NITROBENZENE

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Learning outcomes

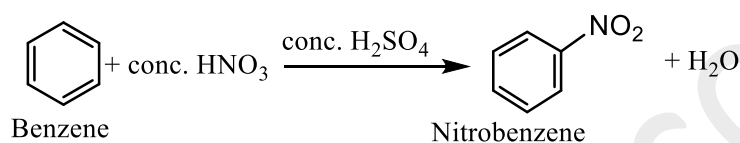
After completion of the chapter, Students should be able to:

- Show preparation of nitrobenzene from benzene.
- State physical properties of nitrobenzene.
- Explain chemical properties of nitrobenzene, i.e. reduction in
- different media and electrophilic substitution reactions (nitration, sulphonation & bromination).
- State important uses of nitro compounds.

Preparation of Nitrobenzene

Principle

Nitrobenzene is prepared in the laboratory by direct nitration of benzene with nitrating mixture, i.e. a mixture of concentrated sulphuric acid and conc. HNO_3 at a **temperature of about 60°C** .



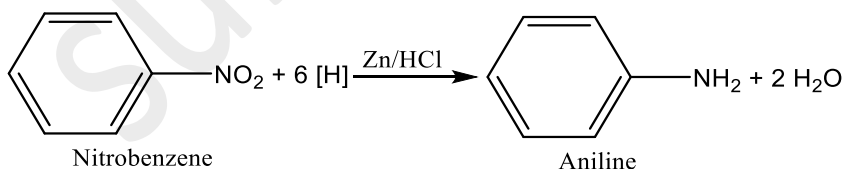
Physical Properties

1. Nitrobenzene is a pale-yellow oily liquid with a bitter almond smell.
2. It solidifies at 5.7°C and boils at 210°C and its specific gravity is 1.2.
3. It is insoluble in water but soluble in organic solvents like Ether, Benzene, Chloroform, etc.

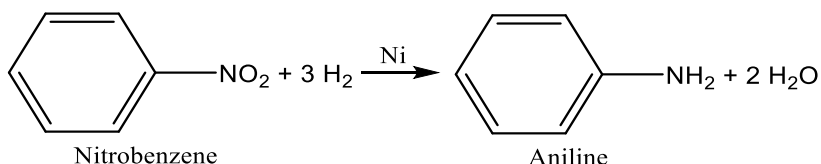
Chemical Properties

Reduction in different media

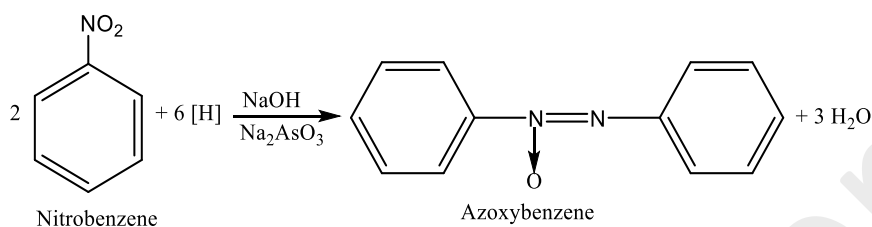
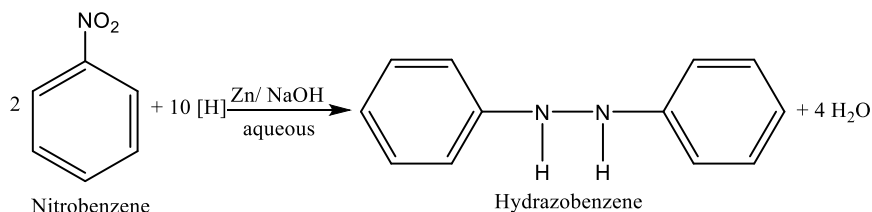
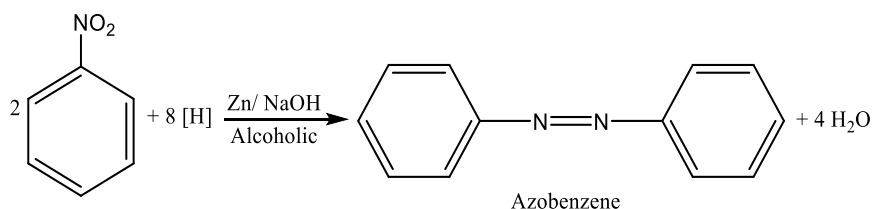
1. In acidic medium (Fe/HCl , Zn/HCl , or Sn/HCl)



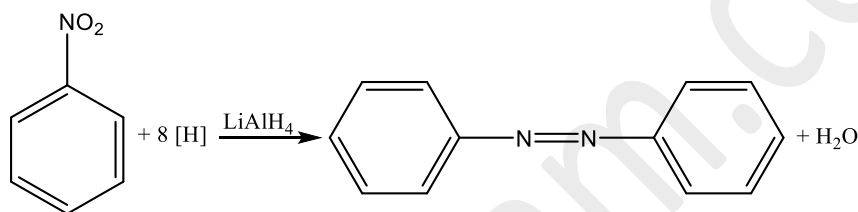
2. In catalytic medium (H_2 with Pd, Pt, or Ni)



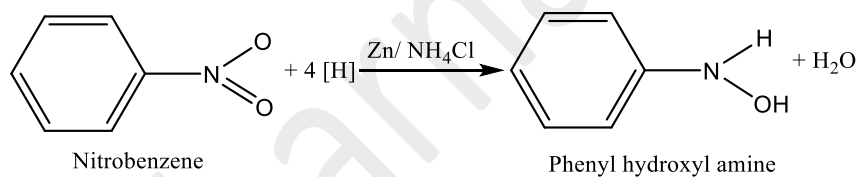
3. In Alkaline medium



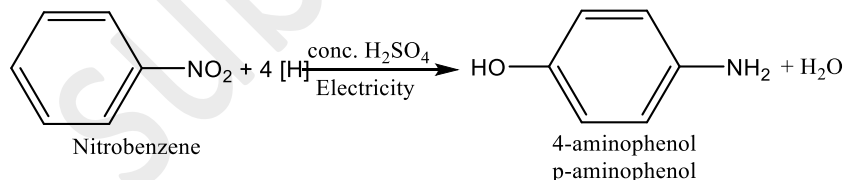
4. With Lithium aluminium hydride



5. In neutral medium



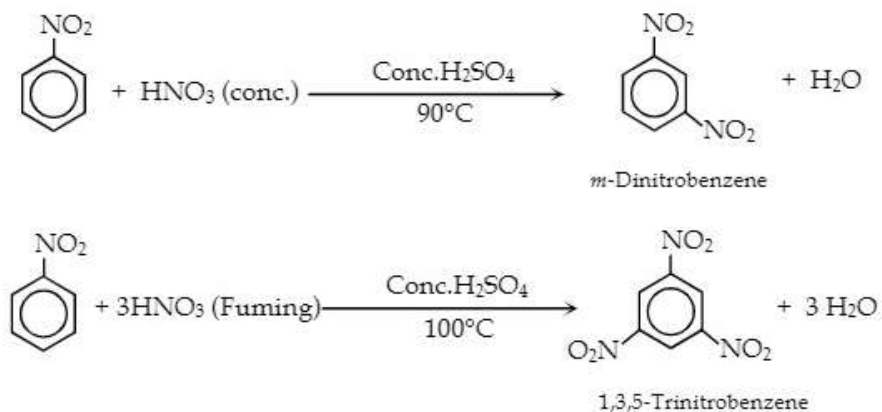
6. Electrolytic medium



Ring substitution

The nitro group is a deactivating group in electrophilic aromatic substitution reactions; hence, these reactions are slower than in Benzene.

The nitro group is meta-directing in electrophilic aromatic substitution reactions; hence, meta-substituted products are obtained. For example,



Nitrobenzene undergoes sulphonation with concentrated fuming sulphuric acid when heated. It also undergoes bromination with bromine in the presence of FeBr_3 as a catalyst when heated. (practice writing these reactions- check from book if u have written correctly) Nitrobenzene does not undergo Friedel-Crafts reactions.

Uses of nitro compounds.

- 1) Nitromethane can be used to produce **chloropicrin**, which is used as a broad-spectrum antimicrobial, fungicide, herbicide, insecticide and a component of tear gas.
- 2) These can be used as solvents.
- 3) A few nitroalkanes are used as explosives.
- 4) Nitrobenzene is used to prepare aniline and other dye stuff.
- 5) It is also used as a solvent in shoe polishes.

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