

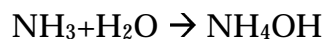
PROPERTIES AND USES OF AMMONIA

Physical Properties

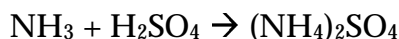
Molecular weight	17
Boiling point °C	-33 to -35 °C
Freezing point °C	-77.7
Critical temperature °C	133
Critical pressure bar	112.8
Specific heat kJ/(kg K)	
0 °C	2.0972
100 °C	2.2262
200 °C	2.1056
Standard heat of formation, kJ/kmol	-46 222
Solubility in water (wt%)	
0 °C	42.8
20 °C	33.1
40 °C	23.4
60 °C	14.1
Specific gravity of anhydrous ammonia	
-40 °C	0.69
0 °C	0.639
40 °C	0.580

Chemical Properties

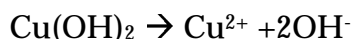
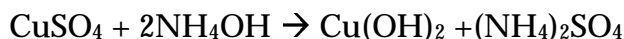
1) Ammonia is a weak base and when dissolved in water ionizes to form Ammonium ions NH_4^+ and hydroxyl ions OH^-



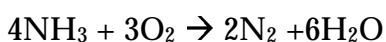
2) Ammonia forms ammonium salts and water with acids



3) Ammonia solution precipitates most metal hydroxides from solutions of their salts. In some cases like copper the hydroxide is soluble in excess owing to formation of complex ion.

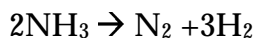


4) Ammonia does not burn readily in air, nor is it a supporter of combustion, but warm ammonia burns in Oxygen to form nitrogen and water.

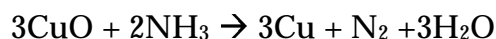


In the presence of platinum gauze and other catalysts, oxides of nitrogen and ammonium nitrate are formed.

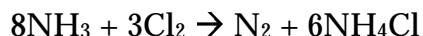
5) Ammonia is a relatively stable compound. When strongly heated or sparked it decomposes into its constituent elements.



6) Ammonia behaves as mild reducing agent. It reduces many heated metallic oxides like CuO PbO etc

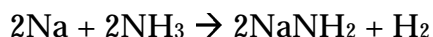


7) Ammonia reacts with halogens to give ammonium halides.



with excess halogens it forms dangerously explosive nitrogen trihalides.

8) Ammonia reacts with certain metals when heated. Sodium forms Sodamide and hydrogen.



USES OF AMMONIA

Ammonia is the single most widely used compound in the fertilizer industry. It is the starting material for the production of a various number of nitrogenous fertilizers like ammonium phosphates, ammonium sulfate, ammonium nitrate etc.

It is used directly or indirectly as the source for the production of hexamethylenedeamine for the manufacture of nylon 6,6. In the manufacture of rayon, ammonia is used in the preparation of ammoniacal copper hydroxide solution for dissolving the copper linters. Oxidation of propylene with ammonia gives acrylonitrile, used for the manufacture of acrylic fibres, resins, and elastomers.

Hexamethylenetetramine, produced from ammonia and formaldehyde, is used in the manufacture of phenolic thermosetting resins. Toluene 2,4 disocyanate (TDI), employed in the production of polyurethane foam, indirectly consumes ammonia because nitric acid is a raw material in the TDI manufacturing process. Urea produced from ammonia is used in the manufacture of urea-formaldehyde synthetic resins. Melamine is produced by polymerization of dicyandiamine and high pressure high temperature pyrolysis of urea, in the presence of ammonia

Lesser known uses of Ammonia are

1. As a refrigerant in both compression and absorption systems
2. In the pulp and paper industry for the pulping of wood
3. As a corrosion inhibitor in petroleum refineries.
4. In rubber production for the stabilization of natural and synthetic latex to prevent coagulation.
5. In the food and beverage industry as a source of nitrogen required for the growth of yeast and micro-organism
6. As a curing agent in tanning industries.

In the manufacture of pharmaceuticals such as sulfanilamide, sulfathiazole etc.