

Structure And Uses Of Amines



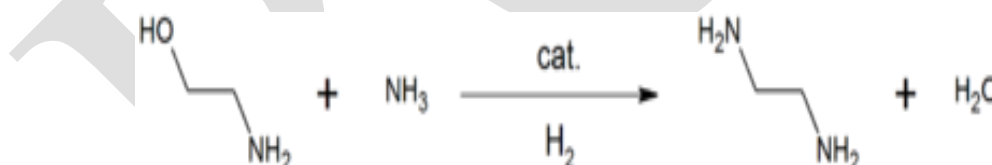
ETHANOLAMINE

Ethanolamine (2-aminoethanol, monoethanolamine, ETA, or MEA) is an organic chemical compound with the formula $\text{HOCH}_2\text{CH}_2\text{NH}_2$ ($\text{C}_2\text{H}_7\text{NO}$). The molecule is bifunctional, containing both a primary amine and a primary alcohol.

Ethanolamine is a colorless, viscous liquid with an odour reminiscent of ammonia. Its derivatives are widespread in nature; e.g., lipids, as precursor of a variety of N-acylethanolamines (NAE) that modulate several animal and plant physiological processes such as seed germination, plant-pathogen interactions, chloroplast development and flowering

Uses:

- The ethanolamines comprise a group of amino alcohols.
- A class of antihistamines is identified as ethanolamines, which includes carbinoxamine, clemastine, dimenhydrinate, Chlorphenoxamine, diphenhydramine and do Ethanolamine is commonly called monoethanolamine or MEA in order to be distinguished from diethanolamine (DEA) and triethanolamine (TEA).
- It is used as feedstock in the production of detergents, emulsifiers, polishes, pharmaceuticals, corrosion inhibitors, and chemical intermediates.
- For example, reacting ethanolamine with ammonia gives ethylenediamine, a precursor of the commonly used chelating agent, EDTA.



- Like other amines, monoethanolamine is a weak base and this property is exploited in its use in gas scrubbing. Monoethanolamines can scrub combusted-coal, combusted-methane and combusted-biogas flue emissions of carbon dioxide (CO_2) very efficiently. Monoethanolamine scrubbing reduces climate change and can make historical coal and biogas industry more modern, healthier and more marketable. Legally, it is especially relevant to the Paris Agreement. MEA carbon dioxide scrubbing is also used to regenerate the air on submarines.
- Solutions of MEA in water are used as a gas stream scrubbing liquid in amine treaters. For example, aqueous MEA is used to remove carbon dioxide (CO_2) and hydrogen sulfide (H_2S) from various gas streams; e.g., flue gas and sour natural gas. The MEA ionizes dissolved acidic compounds, making them polar and considerably more soluble.

- g. MEA scrubbing solutions can be recycled through a regeneration unit. When heated, MEA, being a rather weak base, will release dissolved H_2S or CO_2 gas resulting in a pure MEA solution.

Other uses

- h. In pharmaceutical formulations, MEA is used primarily for buffering or preparation of emulsions. MEA can be used as pH regulator in cosmetics.
- i. It is also an injectable sclerosant as a treatment option of symptomatic hemorrhoids. 2-5 ml of ethanolamine oleate can be injected into the mucosa just above the hemorrhoids to cause ulceration and mucosal fixation thus preventing hemorrhoids from descending out of the anal canal

ETHYLENE DIAMINE

Ethylenediamine (abbreviated as en when a ligand) is the organic compound with the formula $\text{C}_2\text{H}_4(\text{NH}_2)_2$. This colorless liquid with an ammonia-like odor is a strongly basic amine.



It is a widely used building block in chemical synthesis, with approximately 500,000 tonnes produced in 1998.

Ethylenediamine readily reacts with moisture in humid air to produce a corrosive, toxic and irritating mist, to which even short exposures can cause serious damage to health (see safety). Ethylenediamine is the first member of the so-called polyethylene amines.

Uses:

1. Ethylenediamine is used in large quantities for production of many industrial chemicals. It forms derivatives with carboxylic acids (including fatty acids), nitriles, alcohols (at elevated temperatures), alkylating agents, carbon disulfide, and aldehydes and ketones. Because of its bifunctional nature, having two amines, it readily forms heterocycles such as imidazolidines.
2. Precursor to chelation agents, drugs, and agrochemicals
3. A most prominent derivative of ethylenediamine is the chelating agent EDTA, which is derived from ethylenediamine
4. Hydroxyethylethylenediamine is another commercially significant chelating agent.
5. Numerous bio-active compounds and drugs contain the $\text{N-CH}_2\text{-CH}_2\text{-N}$ linkage, including some antihistamines.
6. Salts of ethylenebisdithiocarbamate are commercially significant fungicides under the brand names Maneb, Mancozeb, Zineb, and Metiram. Some imidazoline-containing fungicides are derived from ethylenediamine.

7. Pharmaceutical ingredient

Ethylenediamine is an ingredient in the common bronchodilator drug aminophylline, where it serves to solubilize the active ingredient theophylline. Ethylenediamine has also been used in dermatologic preparations, but has been removed from some because of causing contact dermatitis.

Ethylenediamine-derived antihistamines are the oldest of the five classes of first-generation antihistamines. The other classes are derivatives of ethanolamine, alkylamine, piperazine, and others (primarily tricyclic and tetracyclic compounds related to phenothiazines, tricyclic antidepressants, as well as the cyproheptadine-phenindamine family)

Role in polymers

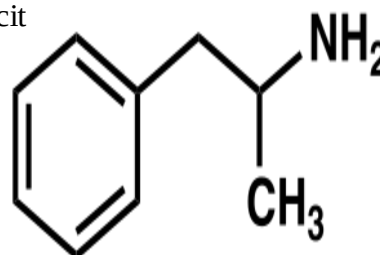
8. Ethylenediamine, because it contains two amine groups, is a widely used precursor to various polymers. Condensates derived from formaldehyde are plasticizers. It is widely used in the production of polyurethane fibers.
9. The bleaching activator tetraacetythylenediamine is generated from ethylenediamine. The derivative N,N-ethylenebis(stearamide) (EBS) is a commercially significant mold-release agent and a surfactant in gasoline and motor oil.

Other applications

10. as a solvent, it is miscible with polar solvents and is used to solubilize proteins such as albumins and casein. It is also used in certain electroplating baths.
11. as a corrosion inhibitor in paints and coolants.
12. ethylenediamine dihydroiodide (EDDI) is added to animal feeds as a source of iodide.
13. chemicals for color photography developing, binders, adhesives, fabric softeners, curing agents for epoxies, and dyes.

AMPHETAMINE

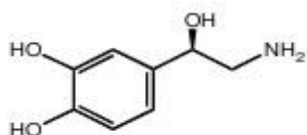
Amphetamine (alpha-methylphenethylamine) is a potent central nervous system (CNS) stimulant that is used in the treatment of attention deficit hyperactivity disorder (ADHD), narcolepsy, and obesity. - Amphetamine was discovered in 1887 and exists as two enantiomers: levoamphetamine and dextroamphetamine.



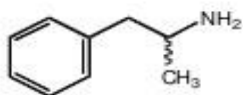
Uses:

- Amphetamine is used to treat Attention Deficit Hyperactivity Disorder (ADHD), Narcolepsy (a sleep disorder), and Obesity.
- Amphetamine is used by some athletes for its psychological and athletic performance-enhancing effects, such as increased endurance and alertness.
- At therapeutic doses, amphetamine causes emotional and cognitive effects such as euphoria, change in desire

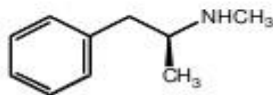
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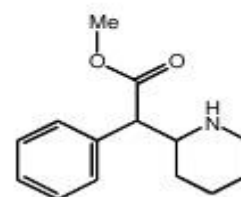
Norepinephrine
(Noradrenaline)



Amphetamine



Methamphetamine



Methylphenidate
(Ritalin™)

- **Amphetamine** is a stimulant that is now primarily used to treat narcolepsy and attention-deficit hyperactivity disorder. It is also used recreationally as a club drug and as a performance enhancer.
- The name amphetamine is derived from its chemical name alpha-methylphenethylamine.
- Initially, amphetamine was more popularly used to diminish the appetite and to control weight.
- Because of the widespread use of amphetamines as a treatment for narcolepsy and ADD/ADHD, prescription amphetamines are subject to diversion and are one of the most frequently-abused drugs in high schools and colleges.