Ingredient found in ASAP Gel & Silver Shield Gel

Triethanolamine

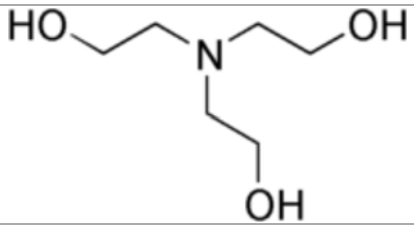
From Wikipedia, the free encyclopedia

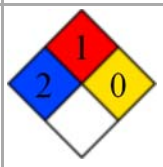
Triethanolamine, often abbreviated as **TEA**, is an organic chemical compound which is both a tertiary amine and a triol. A triol is a molecule with three alcohol groups. Like other amines, triethanolamine is a strong base due to the lone pair of electrons on the nitrogen atom. Triethanolamine can also be abbreviated as **TEOA**, which can help to distinguish it from triethylamine. Approximately 150000 metric tons were produced in 1999.[1]

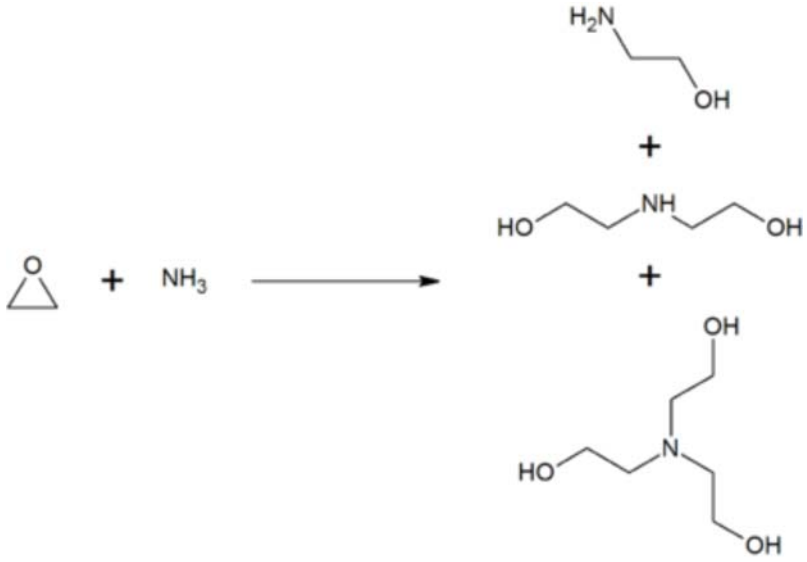
Contents

Production

Triethanolamine is produced from the reaction of ethylene oxide with aqueous ammonia, also produced are ethanolamine and diethanolamine. The ratio of the products can be controlled by changing the stoichiometry of the reactants.[2]

Triethanolamine	
	
IUPAC name	
2,2',2''-Nitrilotriethanol	
Other names	
Tris(2-hydroxyethyl)amine, 2,2',2''-Trihydroxy-triethylamine, Triethylolamine, Trolamine, TEA, TEOA	
Identifiers	
CAS number	102-71-6 ✓
PubChem	7618
ChemSpider	13835630 ✓
UNII	9O3K93S3TK ✓
EC number	203-049-8
KEGG	D00215 ✓
ChEBI	CHEBI:28621
ChEMBL	CHEMBL446061 ✓
RTECS number	KL9275000
SMILES	
InChI	
Properties	
Molecular formula	$C_6H_{15}NO_3$
Molar mass	149.188 g/mol
Appearance	Pale yellow liquid, hygroscopic
Density	1.126 g/cm^3
Melting point	20.5 °C, 294 K, 69 °F
Boiling point	335.4 °C, 609 K, 636 °F (208 °C at 20 hPa)
Solubility in water	Miscible
Hazards	

MSDS	JT Baker (http://www.jtbaker.com /msds/englishhtml/t5291.htm)
R-phrases	R36 R37 R38
S-phrases	S26 S36
NFPA 704	
Flash point	179 °C
Autoignition temperature	325 °C
Explosive limits	3.6 - 7.2 %
✓(what is this?) (verify) Except where noted otherwise, data are given for materials in their standard state (at 25 °C, 100 kPa)	
Infobox references	



Applications

Triethanolamine is used primarily as an emulsifier and surfactant. It is a common ingredient in formulations used for both industrial and consumer products. The triethanolamine neutralises fatty acids, adjusts and buffers the pH, and solubilises oils and other ingredients that are not completely soluble in water. Some common products in which triethanolamine is found are liquid laundry detergents, dishwashing liquids, general cleaners, hand cleaners, polishes, metalworking fluids, paints and printing inks[3].

It also serves as a pH balancer in many different cosmetic products - ranging from cleansing creams and milks, skin lotions, eye gels, moisturizers, shampoos, shaving foams etc. TEA is a fairly strong base: a 1% solution has a pH of approximately 10, whereas the pH of skin is below pH 7. Cleansing milk/cream emulsions based on TEA are particularly good at removing makeup. Because of its high alkalinity and the possibility that it converts to nitrosamines, its use in cosmetics was once expected to diminish. It is still widely used as of 2009.

Cement production

Triethanolamine is also used as organic additive (0.1 wt. %) in the grinding of cement clinker. It facilitates the grinding process by preventing agglomeration and coating of the powder at the surface of balls and mill wall.[4]

Precursor to other compounds

Various ear diseases and infections are treated with eardrops containing triethanolamine polypeptide oleate-condensate, such as Cerumenex in the United States.

TEA is listed under Schedule 3, part B of the Chemical Weapons Convention as it can be used in the manufacture of nitrogen mustards.

In the laboratory and in amateur photography

Another common use of TEA is as a complexing agent for aluminium ions in aqueous solutions. This reaction is often used to mask such ions before complexometric titrations with another chelating agent such as EDTA. TEA has also been used in photographic (silver halide) processing. It has been promoted as a useful alkali by amateur photographers.

In Electroless Plating TEA is now commonly and very effectively used as a complexing agent in Electroless Plating.

Toxicology

Allergic reactions

A 1996 study found that Triethanolamine (TEA) occasionally causes contact allergy.[5] A 2001 study found TEA in a sunscreen caused an allergic contact dermatitis.[6] A 2007 study found TEA in ear drops caused a contact allergy.[7] Systemic and respiratory tract (RT) toxicity was analyzed for 28 days in a nose specific inhalation 2008 study in Wistar rats; TEA seems to be less potent in regard to systemic toxicity and RT irritancy than diethanolamine (DEA). Exposure to TEA resulted in focal inflammation, starting in single male animals from 20 mg/m3 concentrations.[8] A 2009 study stated patch test reactions reveal a slight irritant potential instead of a true allergic response in several cases and also indicated the risk of skin sensitization to TEA seems to be very low.[9]

Tumors

Reports indicated that TEA causes an increased incidence of tumor growth in the liver in female B6C3F1 mice, but not in male mice or in Fischer 344 rats.[10] A 2004 study concluded "TEA may cause liver tumors in mice via a choline-depletion mode of action and that this effect is likely caused by the inhibition of choline uptake by cells."[10]

Environmental toxicity

A 2009 study found that TEA has potential acute, sub-chronic and chronic toxicity properties in respect to aquatic species.[11]

References

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See also

- Complexometric titration
- Diethanolamine
- Ethanolamine
- Ethanol
- Triethylamine

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