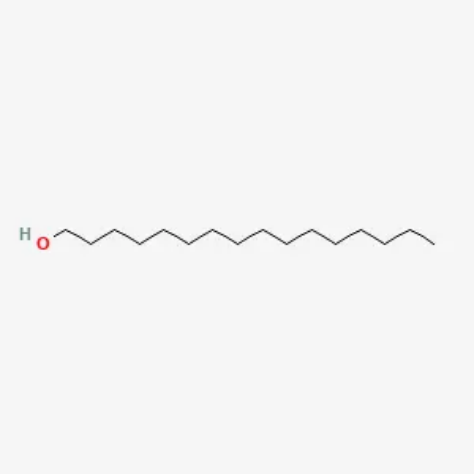
Cetyl Alcohol

Basic Information



Cetyl Alcohol Structure

IUPAC Name	**Hexadecan-1-ol**
CAS Number	**36653-82-4**
HS Code	**2905.17**
Molecular Formula	**C16H34O**
Structural Formula	**CH3(CH2)14CH2OH**
Synonyms	**1-Hexadecanol, Palmityl alcohol, C16 fatty alcohol, Ethal**
Molecular Weight	**242.44 g/mol**

Description

Cetyl alcohol is a long-chain fatty alcohol with a 16-carbon chain. Despite its name, it is not a traditional alcohol in the intoxicating sense but rather a waxy, solid substance used extensively in cosmetics and pharmaceuticals as an emulsifier, emollient, and thickener.
It was historically derived from spermaceti (whale oil) but is now commercially produced from the reduction of palmitic acid or through the hydrogenation of palm oil-derived fatty acid esters.
Cetyl alcohol is widely used in skin creams, lotions, hair conditioners, and ointments. It imparts a smooth, creamy texture to formulations and helps stabilize emulsions.

Chemical and Physical Properties

Physical Description	**White waxy solid or flakes with a faint characteristic odor.**
Color / Form	**White.**
Odor	**Faint, characteristic fatty odor.**
Taste	**Bland.**
Boiling Point	**Approx. 344 °C**
Melting Point	**49–51 °C**
Flash Point	**~185 °C**
Solubility	**Insoluble in water; soluble in ethanol and ether.**
Density	**Approx. 0.811 g/cm³ (liquid)**
Vapor Density	**Greater than air.**
Vapor Pressure	**Negligible at ambient temperature.**
Stability / Shelf Life	**Stable under normal conditions. Avoid strong oxidizing agents.**
Viscosity	**Solid at room temperature; melts to low-viscosity liquid above 50 °C.**
Heat of Combustion	**Approx. ?10,160 kJ/mol.**

Polymerization	**No hazardous polymerization.**
Ionization Potential	**No data available.**

Uses and Manufacturing

Uses

Cetyl alcohol is one of the most versatile and widely used fatty alcohols in the cosmetic and personal care industry. It functions primarily as an emollient, emulsifier, thickener, and co-emulsifier in oil-in-water (o/w) and water-in-oil (w/o) emulsions. In skin creams and body lotions, it contributes to a smooth, creamy skin feel and improves spreadability. In hair conditioners and hair masks, cetyl alcohol deposits on the hair shaft, improving softness, combability, and reducing static electricity.

Pharmaceutical applications include its use as a base ingredient in topical ointments and creams (e.g., cetyl alcohol is a component of cetomacrogol cream), suppository bases, and tablet coatings. It is listed in multiple pharmacopoeias (USP, Ph.Eur., BP) as an approved excipient.

In the manufacturing of surfactants and detergents, cetyl alcohol is used as a raw material for the production of cetyl sulfate, ethoxylated cetyl alcohols (non-ionic surfactants), and other cetyl-derived amphiphiles. It is also used in the production of specialty waxes, polishes, candles, and lubricant formulations. Industrial uses include its application as a foam stabilizer and rheology modifier in drilling fluids and as a textile processing aid.

Methods of Manufacturing

Cetyl alcohol is produced commercially by the catalytic hydrogenation of methyl palmitate or palmitic acid (derived from palm oil) under high-pressure hydrogen in the presence of copper chromite or copper-zinc oxide catalyst at temperatures of 200–300 °C and pressures of 100–300 bar.

The crude fatty alcohol product is then purified by fractional distillation under vacuum to isolate the C16 fraction. The purity of the final product is determined by GC analysis (typically >95% or >99% for high-purity cosmetic/pharma grades). Other quality parameters include melting point, acid value, hydroxyl value, iodine value, and color (Hazen/APHA).

Palm-derived cetyl alcohol is the predominant commercial product globally, with major production located in Southeast Asia (Malaysia and Indonesia). Tallow-derived cetyl alcohol is also available from animal fat-based production. Biosynthetic routes via fermentation of sugars are under development but not yet commercially significant.

Hazard Identification

Hazard Summary

Low acute toxicity. May cause mild skin or eye irritation on direct contact. Dust from powdered material may be irritating to the respiratory tract.

Fire Hazard

Combustible solid. Dust may form explosive mixtures in air.

Skin, Eye & Respiratory Irritations

Generally well tolerated on skin. May cause mild eye irritation on direct contact. Dust inhalation may cause respiratory irritation.

Safety and First Aid

Physical Dangers

Combustible solid; dust/air mixtures may be explosive.

Skin First Aid

Wash with soap and water.

Eye First Aid

Flush with water for 15 minutes. Seek medical advice if irritation persists.

Ingestion First Aid

Rinse mouth. Not considered toxic in small amounts; seek medical advice for large ingestion.

Fire Fighting Procedures

Use CO?, foam, or dry chemical. Do not use water jet which may spread burning material.

Handling and Storage

Nonfire Spill Response

Small spill (solid): Sweep or vacuum up spilled material and place in labeled containers for disposal. Avoid generating dust. Clean residual with detergent and water.
Molten liquid spill: Allow to solidify before cleanup. Scrape up solidified material and place in waste containers. Do not allow molten material to enter drains. Warn personnel of slip hazard from solidified material on floor.

Safe Storage

Store in original, tightly closed containers in a cool, dry, well-ventilated warehouse. Keep away from heat sources, ignition sources, and oxidizing agents. Prevent moisture ingress. Store away from incompatible materials (strong oxidizers, strong acids). When stored as a melt in tanks, maintain temperature at 55–65 °C; avoid overheating.

Storage Conditions

Recommended storage temperature: 15–30 °C (solid form). If stored as a melt, maintain at 55–65 °C. Shelf life: 24 months in original sealed containers. Suitable containers: HDPE, stainless steel 304/316, or mild steel (for melt storage). Protect from moisture and excessive heat. Drums should be stored upright.