

Introduction

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Isopropyl alcohol, which is often known as isopropanol or 2-propanol, is a flammable and colourless chemical compound. $\text{CH}_3\text{CHOHCH}_3$ is the isopropanol formula and it has a strong odour. The simplest example of a secondary alcohol is an isopropyl group linked to a hydroxyl group, in which the alcohol carbon atom is attached to 2 other carbon atoms. It is a structural isomer of 1-propanol and ethyl methyl ether. The IUPAC name is given as propan-2-ol.

It's a common ingredient in antiseptics, disinfectants, and detergents, and it's used in the manufacture of a wide variety of industrial and household chemicals.

Isopropanol Structure

Isopropanol formula is $\text{CH}_3\text{CHOHCH}_3$. The isopropanol structure or the Isopropyl Alcohol Structure – $\text{C}_3\text{H}_8\text{O}$ can be represented as follows:

Properties

Water, ethanol, and chloroform are all miscible with isopropyl alcohol. Ethyl cellulose, polyvinyl butyral, a range of oils, alkaloids, gums, and natural resins are all dissolved by it. Unlike ethanol or methanol, isopropyl alcohol is not miscible with salt solutions and can be separated from aqueous solutions by adding a salt such as sodium chloride. The separation of concentrated isopropyl alcohol into a separate layer is referred to as salting out.

When isopropyl alcohol reacts with water, it forms an azeotrope with a boiling point of 80.37°C (176.67°F) and a bulk content of 87.7% isopropyl alcohol (91%). The melting points of alcohol mixes are low. It has a faint bitter flavour and should not be taken.

Isopropyl alcohol becomes increasingly viscous as the temperature drops, and it freezes at 89°C (128°F).

In the ultraviolet-visible spectrum, isopropyl alcohol has a maximum absorbance of 205 nm.

Function of Isopropanol in DNA Extraction

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The DNA extraction procedure starts with sonication, agitation, and the addition of SDS detergents to mechanically separate the nuclear contents from the remainder of the cell. During this stage of the procedure, researchers generally add ammonium, sodium acetate, or similar salts to further break down cell components and then extract off the DNA linked proteins.

Isopropanol Precipitation of DNA

Since DNA is insoluble in ethanol and isopropanol, adding alcohol to the solution and centrifuging it will induce the DNA proteins to separate from the solution. When the concentration of DNA in a sample is high, adding ethanol causes a white precipitate to form almost immediately. Isopropanol may work better than ethanol to precipitate available proteins if the DNA concentration in the sample is low. In addition, isopropanol is frequently used to precipitate DNA from huge volumes because the isopropanol uses less alcohol.

Ethanol and isopropanol can also be used to wash away any salt residue. The precipitated DNA protein will form a pellet after being washed in alcohol and centrifuged, which can then be washed in alcohol again, dried, and re-suspended in a Tris or TE buffer. Simply place the cleaned pellet on the lab table for a few minutes, as overdrying the sample can denature the DNA. If isopropanol was used instead of ethanol during the extraction, the sample may not stick as well to the tube and may require more drying time.

Toxicity

After oral administration, isopropanol is fast absorbed (within 30 minutes) and well absorbed (within 70% bioavailability). Alcohol dehydrogenase converts isopropanol to acetone in a first-order, concentration-dependent way. Isopropanol's apparent first-order metabolism is most likely the product of significant acetone clearance in the acetone.

Approximately 80% of systemic isopropanol is converted to acetone, with the other 20% eliminated unchanged through the kidneys. Isopropanol can be excreted in small amounts through the lungs. Isopropanol metabolism will be competitively antagonised by ethanol via alcohol dehydrogenase, resulting in a longer isopropanol t

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Toxicosis

70% of rubbing alcohol, antifreeze, detergents, window cleaning products, and disinfectants include isopropanol (isopropyl alcohol), which has a molecular weight of 60

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isopropanol for colic by mistake by nasogastric intubation; the isopropanol was mistaken for mineral oil (Somerville and Plumlee, 1996).

Toxicokinetics

Isopropanol is approximately two times as toxic as ethanol. It is rapidly absorbed from the GI tract, with about 80% of it being converted to acetone, which is similarly a CNS depressant, but with a much longer half-life (16–20 h) than alcohol.

Diagnosis and Treatment

CNS depression, hypotension, vomiting, and abdominal pain due to severe gastritis secondary to direct irritation are clinical indications of isopropanol toxicosis, which are comparable to those of ethanol toxicosis. Patients who have ingested isopropanol have an acetone-like odour in their breath (Somerville and Plumlee, 1996). Fluids, correction of acid–base abnormalities, and, if necessary, aided respiration are all part of the supportive treatment (Oehme and Kore, 2006). Isopropanol and acetone can be extracted via dialysis, and 4-methylpyrazole can prevent isopropanol from converting to acetone.

Isopropanol Uses

Isopropyl alcohol was used in 45,000 metric tonnes in the United States in 1990, largely as a solvent for coatings and industrial processes. 5400 metric tonnes were used for household and personal care items in that year. Because of its low toxicity, isopropyl alcohol is particularly popular in pharmaceutical applications. As a chemical intermediate, some isopropyl alcohol is used. While isopropyl alcohol can be converted to acetone, the cumene method has a larger effect.

Let us look at the isopropanol uses across various industries here:

Medical

A 60–70% solution of isopropyl alcohol or ethanol in water is often found in rubbing alcohol, hand sanitizer, and disinfection pads. Water is required to open bacterial cell membrane pores, which serve as a channel for isopropyl alcohol. As a hand sanitizer, 75% of solution in water can be used. Isopropyl alcohol is used as a water-drying aid to prevent otitis externa, also known as swimmer's ear.

Automotive

Isopropyl alcohol is a primary ingredient in fuel additives for "gas dryers." Water is an issue in fuel tanks in large quantities because it separates from the gasoline and can freeze in

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than insoluble water. As a windshield or door lock de icer, isopropyl alcohol is widely available in aerosol cans.

Did You Know?

Isopropyl alcohol vapour is denser than air and flammable, ranging from 2 to 12.7% flammability in air. It should be protected away from heat and open flames. It has been observed that condensing isopropyl alcohol over magnesium produces peroxides, which can explode when concentrated. Isopropyl alcohol irritates the eyes and is a possible allergen. Wearing protective gloves is strongly advised.

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FAQs (Frequently Asked Questions)

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Although isopropyl alcohol can be used for anaesthesia, it has a number of negative drawbacks or attributes that prevent it from being used. Isopropyl alcohol, like ether, can be used as a solvent or anaesthetic by inhaling fumes or taking it orally. Scientists and some veterinarians first used the solvent as a general anaesthetic for small mammals including rodents.

However, it was quickly phased out due to the multitude of side effects, including lung irritation, internal bleeding, and vision and hearing issues. Animals have died as a result of respiratory failure in rare cases.

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