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Product Safety -

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Product Safety Assessment (PSA): Isopropanol

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Names

CAS No. 67-63-0	Propyl alcohol	1-Methylethyl alcohol
Isopropyl alcohol	2-Propyl alcohol	1-Methylethanol
Isopropanol	Propan-2-ol	2-Hydroxypropan
2-Propanol	Dimethyl carbinol	2-Hydroxypropane
IPA		

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Product Overview

Isopropanol (IPA) is one of the most widely used [solvents](#) in the world; also used as a [chemical intermediate](#). See [Product Uses](#).

IPA exposure is possible in both industrial and consumer applications. Occupational exposure limits have been established to control the allowable amount of exposure in workplace settings. Consumer exposure, generally infrequent and short in duration, is also highly dependent upon the conditions under which IPA is used. See [Exposure Potential](#).

IPA does not cause adverse [health](#) or [environmental effects](#) at levels typically found in the workplace or in the environment.

Flammable with high vapor pressure; use good ventilation and avoid all ignition sources. See [Physical Hazard Information](#).

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Manufacture of Product

Capacity – Global IPA production capacity reached 2,153 thousand metric tons (4,747 million pounds) in 2003, although global capacity use was roughly 80%.¹ Approximately 74% of the global IPA capacity is concentrated in the United States, Western Europe and Japan. Dow produced approximately 12% of the IPA in 2003² at its site in Texas City, Texas, where it has 411 thousand metric tons (906 million pounds) capacity.

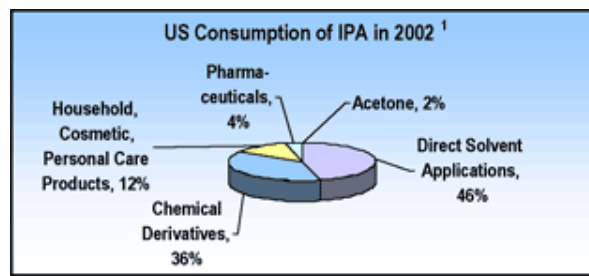
Process – Two processes are used to produce IPA.

1. A two-step (indirect) [hydrogenation](#) and then [hydrolysis](#) of a petroleum product, propylene, using acid and water.
2. A one-step (direct) hydrogenation of a petroleum product, propylene, with an acid catalyst. (Not used in the United States.)

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Product Description

IPA is a colorless, flammable liquid with a characteristic alcohol / acetone-like odor.³ It mixes completely with most solvents, including water. One well-known yet relatively small use for IPA is "rubbing alcohol," which is a mixture of IPA and water and can be purchased in many pharmacies and grocery stores.



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Product Uses

The largest use for IPA is as a [solvent](#). The second largest use is as a [chemical intermediate](#). IPA is also found in many everyday products such as paints, inks, general-purpose cleaners, disinfectants, room sprays and windshield deicing agents.

IPA produced by Dow is commonly used in nitrocellulose-based lacquers and thinners for wood finishing, in adhesives, pharmaceuticals, cosmetics and toiletries, disinfectants, rubbing compounds, and lithography. It is also used as an ingredient in cleaners and polishers, as a chemical intermediate, and as a [dehydrating agent](#) and extractant.

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Exposure Potential⁴

Based on the uses for IPA, the public could be exposed through:

Workplace exposure – Exposure can occur either in an IPA manufacturing facility or through the evaporation of IPA in various industrial and consumer product applications. Generally, personnel exposures in IPA manufacturing facilities are low because the process, storage and handling operations are enclosed. Less is known about customer workplace exposures, but a study done by the U.S. Environmental Protection Agency (EPA) in 1997 showed that the highest occupational exposures to IPA occurred in the printing industry. In the EPA survey of the printing industry, the highest 8-hour [time-weighted average](#) (TWA) exposure was 161 ppm. The U.S. Occupational Safety and Health Administration (OSHA) [permissible exposure limit](#) (PEL) is 400 ppm (980 mg/m³) (8-hour TWA). The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs[®]) are: 200 ppm (8-hour TWA) and 400 ppm for short-term exposure limit (STEL)⁵.

Consumer exposure to products containing IPA – This category of exposure is highly variable depending on the products used and the conditions under which they are used. Exposure of the majority of consumers to IPA is likely to be infrequent and of short duration. Exposure could occur through use of IPA in personal care items or in lacquers and thinners. The estimate prepared by the U.S. EPA in 1997 was on the order of grams/person for each use.

Environmental releases – [Fugitive emissions](#) (loss of IPA through evaporation from manufacturing facilities) were estimated at 1.5% of the total U.S. production in 1976, and 3.3% in the Netherlands from 1974-1979. However, care must be exercised to minimize environmental releases due to IPA's flammability, which is one of its largest risks.

Large release – Industrial spills or releases are infrequent and often controlled. A spill poses a significant flammability issue. Emergency response personnel generally respond with a controlled burn that limits over-exposure or uncontrolled burning. The combustion products are carbon monoxide (CO), carbon dioxide (CO₂) and water (H₂O).

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Health Information

Under usual conditions of exposure, IPA is quickly converted to acetone once taken into the body. [Acetone](#) is naturally present in virtually every organ and tissue in the human body as a result of metabolic processes.⁶

Toxicology studies have shown that IPA poses a low health hazard and does not cause adverse health or environmental effects at levels typically found in the workplace or the environment.⁷ Overexposure to IPA can cause irritation to the eyes, nose and throat, and may produce central nervous system depression.⁸ These effects are typically mild and end shortly after exposure is terminated, not showing any permanent adverse health effects. In coordination, confusion, hypotension, hypothermia, circulatory collapse, respiratory arrest and death may follow a longer duration or higher levels. Swallowing small amounts is not likely to cause injury; however swallowing larger amounts may cause serious injury, and

even death.⁹

Chronic, prolonged or repeated overexposure to IPA has produced adverse liver effects and kidney effects and/or tumors in male rats. Such effects are believed to be species-specific, however, and unlikely to occur in humans.¹⁰ For more information, view the [Safety Data Sheet](#).

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Environmental Information

Public and wildlife exposure through environmental releases is limited because IPA rapidly biodegrades in water and undergoes [photo-oxidation](#) relatively rapidly in the atmosphere. IPA is not expected to persist in soil due to its rapid evaporation, and has a low potential to [bio-accumulate](#) in aquatic organisms. IPA studies show low toxicity to aquatic organisms and micro-organisms, and toward plant germination and growth.¹¹

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Physical Hazard Information

IPA is a flammable material and should be handled only with adequate ventilation and in areas where ignition sources have been removed (e.g., matches and unprotected light switches).

The flash point for IPA is 53°F / 12°C.¹²

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Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use and/or disposal of Isopropanol. These regulations may vary by city, state, country or geographic region. Information may be found by consulting the relevant [Safety Data Sheet](#) or [Contact Us](#).

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Additional Information:

[Safety Data Sheet](#)

[OECD SIDS Dossier on 2-Propanol \(272KB PDF\)](#)

For further information, see [OECD SIDS program](#)

[Product Information: Isopropanol \(Anhydrous\) \(51KB PDF\)](#)

For additional business information about products like IPA, visit Dow's [Oxygenated Solvents](#) web site.

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In order to view some information you may need to download [Adobe Reader](#).

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References

- ¹ *Chemical Economics Handbook – SRI International*, March 2003, page 3.
- ² *Chemical Economics Handbook – SRI International*, March 2003, page 3.
- ³ *Isopropanol Material Safety Data Sheet*, Dow MSDS#1194, August 6, 2003, page 2.
- ⁴ *Chemical Manufacturers Association IPA SIDS Assessment Profile*, January, 1998, pp. 8-10.
- ⁵ *Isopropanol Material Safety Data Sheet*, Dow MSDS#1194, August 6, 2003, page 7.
- ⁶ *ISOPROPANOL Uses, Benefits and Regulatory Status*, Chemical Manufacturers Association, October 1999, page 4.
- ⁷ *ISOPROPANOL Uses, Benefits and Regulatory Status*, Chemical Manufacturers Association, October 1999, page 2.
- ⁸ *ISOPROPANOL Uses, Benefits and Regulatory Status*, Chemical Manufacturers Association, October 1999, page 4.
- ⁹ *Isopropanol Material Safety Data Sheet*, Dow MSDS#1194, August 6, 2003, page 3.
- ¹⁰ *Isopropanol Material Safety Data Sheet*, Dow MSDS#1194, August 6, 2003, page 3.
- ¹¹ *ISOPROPANOL Uses, Benefits and Regulatory Status*, Chemical Manufacturers Association, October, 1999, page 6.
- ¹² *NFPA Fire Protection Guide to Hazardous Materials 10th Edition*.

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