Product Safety Assessment

**DOW™ Valeraldehyde**

Select a Topic:

- Names
- Product Overview
- Manufacture of Product
- Product Description
- Product Uses
- Exposure Potential
- Health Information
- Environmental Information
- Physical Hazard Information
- Regulatory Information
- Additional Information
- References

**Names**

- CAS No. 110-62-3
- DOW™ valeraldehyde
- Valeric aldehyde
- Amyl aldehyde
- n-Valeraldehyde
- EC No. 203-784-4
- 1-Pentanal
- Butyl formal
- Valerianic aldehyde

**Product Overview**

- **DOW™ valeraldehyde** is a colorless liquid with a pungent odor. It is miscible with many organic solvents and is slightly soluble in water.\(^1,\(^2\) For further details, see Product Description.

- **DOW valeraldehyde** is mainly used as a chemical intermediate for the production of amyl alcohol and valeric acid. Valeraldehyde may also be used as a rubber accelerator and as a fragrance additive. Valeraldehyde is approved by the U.S. Food and Drug Administration (USFDA) for direct use as a flavoring agent (21 CFR Title 21, Part 172.515).\(^1,\(^3\) For further details, see Product Uses.

- **DOW valeraldehyde** is not sold for consumer use. Worker exposure to this material is possible during manufacturing. Valeraldehyde occurs naturally in essential oils and a variety of foods including scrambled eggs, baked potatoes, apples, and fried chicken. Consumers could contact valeraldehyde by ingesting foods containing it.\(^4\) For further details, see Exposure Potential.

- Undiluted valeraldehyde can produce moderate skin and eye irritation. It is an upper respiratory tract irritant via inhalation exposure. Based on similar materials, exposure may cause dermal sensitization.\(^5\) For further details, see Health Information.

- **DOW valeraldehyde** liquid and vapors are flammable. The vapor is heavier than air and can travel long distances and accumulate in low-lying areas, creating an explosion hazard. Avoid static discharge. This material is unstable at elevated temperatures. Product decomposition or polymerization is possible, leading to pressure build-up in closed systems. Avoid contact with air (oxygen), alcohols, amines, ammonia, caustic soda, halogens, iron oxides (rust), mineral acids, and sodium hydroxide.\(^2\) For further details, see Physical Hazard Information.

- **Valeraldehyde** is readily biodegradable, unlikely to accumulate in the food chain, and slightly toxic to aquatic organisms on an acute basis. For further details, see Environmental Information.

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Manufacture of Product

- Capacity – DOW™ valeraldehyde is manufactured at the Texas City, Texas (USA), facility.
- Process – DOW valeraldehyde is manufactured in a closed, continuous process by the reaction of 1-butene with synthesis gas (carbon monoxide and hydrogen) in the presence of a catalyst. This type of reaction is called hydroformylation or the Oxo process. The chemistry is shown below.

\[
\begin{align*}
\text{CH}_3\text{CH}_2\text{CH} &= \text{CH}_2 + \text{CO/H}_2 & \rightarrow & \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO} + \text{CH}_3\text{CH}_2\text{CHCHO} \\
1-\text{Butene} & \quad \text{Synthesis gas} & n-\text{Valeraldehyde} & 2-\text{Methylbutyraldehyde}
\end{align*}
\]

Product Description

DOW™ valeraldehyde is the common name for 1-pentanal. It is a colorless liquid with a pungent odor. It is miscible with many organic solvents and slightly soluble in water. This material is a volatile chemical (i.e. evaporates easily).

Product Uses

DOW™ valeraldehyde is manufactured for use as a chemical building block in the production of amyl alcohol (n-pentanol) and valeric acid. Minor uses include resin chemistry, rubber accelerator additive, and fragrance additive. Naturally occurring valeraldehyde is found in essential oils and plant distillates and may be used to produce some flavor compounds.

Exposure Potential

DOW™ valeraldehyde is used in the production of industrial and consumer products. Based on the uses for this product, the public could be exposed through:

- Workplace exposure – Exposure can occur either in a valeraldehyde manufacturing facility or in the various industrial or manufacturing facilities that use valeraldehyde. It is produced, distributed, stored, and consumed in closed systems. Those working with valeraldehyde in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing facility should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit unnecessary exposure. See Health Information.

- Consumer exposure to products containing valeraldehyde – DOW valeraldehyde is not sold for direct consumer use. Valeraldehyde occurs naturally in some essential oils and foods. Foods that may contain valeraldehyde include baked potatoes, cassava, French mountain cheese, raw beef, roasted filberts, clams, scrambled eggs, unripe apples, and fried chicken. Valeraldehyde is listed by the U.S. Food and Drug Administration (USFDA) for direct use as a flavoring agent (21 CFR Title 21, Part 172.515); however, since DOW Valeraldehyde is not manufactured under Good Manufacturing Practices, it is the responsibility of the customer to determine the suitability of its use for their application. Valeraldehyde is also an emission product of microorganisms and animal waste. It may also be emitted from burning logs and forest fires. See Health Information.
• **Environmental releases** – DOW™ valeraldehyde is utilized entirely in closed systems during manufacture and use. Thus, releases to the environment are expected to be minimal. Because the compound is moderately volatile and slightly soluble in water, once introduced, a portion of the compound will remain dissolved in water. Because valeraldehyde is readily biodegradable, the compound will be removed by sewage treatment plants. In the event of a spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. Respiratory protection is necessary for cleaning up spills and leaks. Eliminate all sources of ignition. This material is considered slightly toxic to aquatic organisms on an acute basis. See Environmental, Health, and Physical Hazard Information.

• **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, dike the area to contain the spill. Keep material out of sewers. If available, use foam to smother or suppress fumes. Positive-pressure, self-contained breathing apparatus (SCBA) with an approved full-face mask is recommended for emergency work. Eliminate all sources of ignition immediately. Use only explosion-proof equipment; ground and bond all containers and handling equipment. This material should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Warn the public of any potential downwind explosion hazard. See Environmental, Health, and Physical Hazard Information.

• **In case of fire** – Evacuate personnel upwind, and out of low areas. Vapors are heavier than air and can travel long distances. Ignition or flashback could occur. Eliminate ignition sources. Use water fog or fine spray, dry-chemical or carbon-dioxide fire extinguishers, or foam to extinguish the fire. Alcohol-resistant foams are preferred. Use of a direct water stream may spread the fire. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

**Health Information**

**Eye and skin contact** – Undiluted valeraldehyde can produce moderate skin irritation. Eye contact with valeraldehyde may cause moderate irritation with slight corneal injury. Vapor may cause eye irritation, experienced as mild discomfort and redness. Similar materials have caused sensitization after skin contact.

**Inhalation** – Prolonged excessive inhalation may cause significant adverse effects. Vapor may cause irritation of the upper respiratory tract (nose and throat). Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

**Ingestion** – This material has low toxicity if swallowed. However, swallowing may result in irritation or burns of the mouth, throat, and gastrointestinal tract. Aspiration into the lungs may occur during ingestion or vomiting causing tissue damage or lung injury.

**Developmental toxicity** – In laboratory animals, similar materials have been toxic to the fetus at doses toxic to the mother. In vitro genetic toxicity studies were negative in some cases and positive in other cases. For similar material(s): Animal genetic toxicity studies were negative.

For more information, see the relevant Safety Data Sheet.
Environmental Information

DOW™ valeraldehyde is moderately volatile. However, because it is slightly soluble in water, once introduced, a portion of the compound will have a tendency to remain in water. It has low to moderate potential to bind to soil or sediment.

DOW valeraldehyde is unlikely to persist in the environment. The compound is readily biodegradable, which suggests the chemical will be rapidly and completely removed from water and soil environments, including biological wastewater treatment plants.

DOW valeraldehyde is not likely to accumulate in the food chain (its bioconcentration potential is low) and is slightly toxic to aquatic organisms on an acute basis.

The Organisation for Economic Co-operation and Development (OECD) SIDS Initial Assessment Profile for valeraldehyde concluded that, although the chemical has properties indicating a potential hazard for the environment, based on its use pattern, rapid biodegradation and limited potential for bioaccumulation, the chemical is currently of low priority for further work. The report may be viewed at the link: http://www.inchem.org/documents/sids/sids/110623.pdf.

For more information, see the relevant Safety Data Sheet.

Physical Hazard Information

DOW™ valeraldehyde is a volatile, flammable liquid that must be stored in vapor-tight equipment under an atmosphere of oxygen-free nitrogen. Valeraldehyde vapor is heavier than air and can travel long distances and accumulate in low-lying areas creating an explosion hazard. Avoid static discharge. This material is unstable at elevated temperatures. Exposure to elevated temperatures can cause decomposition or polymerization leading to pressure build up in closed systems.

Avoid contact with air (oxygen), alcohols, amines, ammonia, caustic soda, halogens, iron oxides (rust), mineral acids, and sodium hydroxide.

For more information, see the relevant Safety Data Sheet.

Regulatory Information

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

- Safety Data Sheet (request from Dow’s Customer Information Group at http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/oxysolvents/contact/index.htm)
- Valeraldehyde, Technical Data Sheet, The Dow Chemical Company, Form No. 327-00018-1001, February 2002

For more business information about DOW™ valeraldehyde, visit the Dow Oxygenated Solvents website at http://www.dow.com/oxysolvents/prod/acids.htm#aldehydes.

References

1 Valeraldehyde, Technical Data Sheet, The Dow Chemical Company, Form No. 327-00018-1001
2 Valeraldehyde Safety Data Sheet for the US, The Dow Chemical Company, ID No. 5422/1001
NOTICES:

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