



Product Safety Assessment

SARAN™ Polyvinylidene Chloride (PVDC) Resins

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Names

- CAS Nos. 25038-72-6, 9011-06-7
- SARAN™ polyvinylidene chloride (PVDC) resins
- SARAN resins
- Vinylidene chloride copolymer
- Vinylidene chloride/methyl acrylate copolymer
- Vinylidene chloride/vinyl chloride copolymer

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Product Overview

- SARAN™ resins are white, odorless granules.¹ These resins are polyvinylidene chloride (PVDC) copolymers made from polymerizing vinylidene chloride with comonomers like vinyl chloride and alkyl acrylates.² For further information, see [Product Description](#).
- SARAN resins are used extensively in packaging applications for food, pharmaceuticals, hygiene products, and sterilized medical products. They offer excellent barrier performance to moisture, oxygen, and odors.³ For further information, see [Product Uses](#).
- Because SARAN resins are used extensively in food packaging, it is possible for consumers to come into contact with them. Workplace exposure is also possible.⁴ For further information, see [Exposure Potential](#).
- SARAN resins are essentially nonirritating to the eyes and skin. Dust from SARAN products may cause temporary mechanical irritation to the skin and eyes under extreme conditions. However, the products are considered to present no significant health hazard.⁵ For further information, see [Health Information](#).
- SARAN resins are expected to be inert in the environment. They are unlikely to accumulate in the food chain, and are practically nontoxic to aquatic organisms on an acute basis.⁶ For further information, see [Environmental Information](#).
- SARAN resins are stable under recommended storage and use conditions. Fine dusts of these resins are capable of forming explosive mixtures when suspended in air. Exposure to elevated temperatures can cause the product to decompose.⁷ For further information, see [Physical Hazard Information](#).

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Manufacture of Product⁸

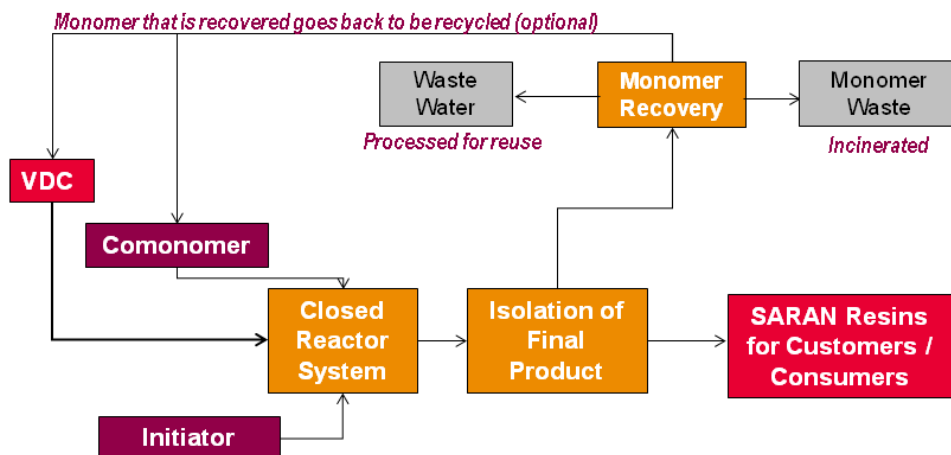
- Capacity – World production of polyvinylidene chloride-based resins is approximately 200,000 metric tonnes (440 million pounds). The Dow Chemical Company produces SARAN resins in Midland, Michigan, U.S.A.

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- **Process** – SARAN™ resins are produced by reacting [vinylidene chloride](#) monomer with comonomers such as [vinyl chloride](#) and alkyl acrylates in closed systems under controlled conditions as shown in the process schematic below. An initiator is added to start the polymerization reaction. The location of comonomer units along the polymer chain depend on the quantity and reaction kinetics of the comonomer that is polymerized with vinylidene chloride.

Schematic of Typical SARAN™ Resin Production



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Product Description^{9,10}

SARAN™ resins are white, odorless granules. These resins are polyvinylidene chloride (PVDC) copolymers made from polymerizing vinylidene chloride with comonomers like vinyl chloride and alkyl acrylates. The location and regularity of the comonomer units affect the properties and performance of the copolymer. SARAN products are available in various formulated grades for specific applications.

Dow sells multilayer films made from SARAN resins, which are marketed under the trade name [SARANEX films](#). Additionally, Dow produces other PVDC-based products under the trade name SERFENE™ barrier adhesives and coatings.

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Product Uses¹¹

SARAN™ resins are used mainly in packaging applications. They offer excellent barrier protection properties and are approved for food contact applications by global regulatory agencies governing food contact standards. The relevant local and national regulations should be consulted for complete details. Applications for SARAN resins include:

- Food packaging and wrap
- Pharmaceuticals packaging
- Unit packaging for hygiene and cosmetic products
- Sterilized medical packaging
- Other non-packaging applications

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Exposure Potential^{12,13}

SARAN™ resins are used in industrial and consumer products. Based on the uses for these products, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in facilities that manufacture SARAN resins, or in the various industrial or manufacturing facilities that use these products. Those working with SARAN resins in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing facility must have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to ensure that exposure guideline limits are not exceeded. See [Health Information](#).

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- **Consumer exposure to products containing SARAN™ resins** – Dow does not sell SARAN resins for direct consumer use, but the products are used extensively in food wrap, as well as packaging for a variety of consumer products including food, pharmaceuticals, medical products, hygiene products, and cosmetics. Phthalates, which are sometimes associated with human health concerns, are not used in SARAN resins. See [Health Information](#).
- **Environmental releases** – SARAN resins may be released if materials containing them are discarded. Small amounts may be released to sewers and enter wastewater-treatment facilities. Spills of dry powder or resins should be thoroughly swept up, using care to minimize the generation of airborne dust. SARAN resins are nonvolatile solids and are expected to be inert and degrade very slowly in the environment. They are unlikely to accumulate in the food chain and are practically nontoxic 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, do not permit dust to accumulate. When suspended in air, dusts can pose an explosion hazard. Eliminate all sources of ignition immediately. Avoid the use of spark-producing tools. Use only explosion-proof equipment; ground and bond all containers and handling equipment. Follow emergency procedures carefully. See [Environmental](#), [Health](#), and [Physical Hazard Information](#).
- **In case of fire** – Deny any unnecessary entry into the area. Fires can be extinguished by conventional means, avoiding any raising of dust by strong water jets. Increased potential for a dust explosion may result from forceful application of fire-extinguishing agents. 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](#).

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Health Information¹⁴

Health information for SARAN™ resins is summarized on the relevant [Safety Data Sheets](#). It is important to note that health risks associated with individual products may vary based on their formulation or intended use. These materials may also contain minor components or additives that have additional health risks. An overview of health information for SARAN resins appears below but it must be noted that the relevant product [Safety Data Sheet](#) is the preferred source for specific health information.

Eye contact – Contact with solids or dusts may cause irritation or corneal injury due to mechanical action. Thermal degradation of the resin may generate hydrogen chloride gas at concentrations that may cause eye irritation.

Skin contact – Brief contact is essentially nonirritating. Prolonged contact may cause slight irritation with local redness. Contact with heated resin during processing can cause thermal burns.

Inhalation – Dust may cause irritation to upper respiratory tract (nose and throat). Thermal degradation of the resin may generate hydrogen chloride gas at concentrations that may cause respiratory irritation.

Ingestion – Material has very low toxicity if swallowed. Harmful effects are not anticipated from swallowing small amounts.

Repeated exposure – Repeated exposures to dusts are not anticipated to result in systemic toxicity or permanent lung injury, however, excessive exposures may cause less severe respiratory effects.

For more information, see the relevant [Safety Data Sheet](#).

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Environmental Information¹⁵

SARAN™ resins are inert polymers that are not soluble in water. The products will sink into sediment or float depending on product density. No appreciable biodegradation is expected, but surface photodegradation with exposure to sunlight and degradation due to mechanical action would be expected.

SARAN™ resins are not expected to accumulate in the food chain due to their relatively high molecular weight (bioconcentration potential is low). They are practically nontoxic to fish and aquatic organisms on an acute basis.

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For more information, see the relevant [Safety Data Sheet](#).

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Physical Hazard Information¹⁶

SARAN™ resins will burn under the right conditions of heat and oxygen supply. Fine dusts are capable of forming explosive mixtures when suspended in air. Spilled material may pose a slipping hazard.

SARAN resins are stable under recommended storage and use conditions. Avoid temperatures above 200°C (392°F). Exposure to elevated temperatures can cause the products to decompose. Generation of gas during decomposition can cause pressure build-up in closed systems. Pressure build-up can be rapid.

Decomposition products depend upon temperature, air supply, and the presence of other materials. Processing may release fumes and other decomposition products. At temperatures exceeding melt temperatures, polymer fragments can be released. Fumes can be irritating. Decomposition products may include, but are not limited to, hydrogen chloride. Hydrogen chloride gas can be emitted during melt processing.

Avoid aluminum or magnesium powder in combination with high shear or high temperature conditions. Processing in the presence of these materials can result in thermal degradation.

Avoid contact with oxidizing materials, zinc compounds, aluminum compounds, aromatic amines, copper compounds, iron compounds, and strong bases. Avoid contact of molten SARAN resins with metals such as aluminum, iron, copper and zinc. Processing in the presence of these materials can cause thermal degradation, releasing hydrogen chloride gas.

For more information, see the relevant [Safety Data Sheet](#).

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Regulatory Information

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

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Additional Information

- Technical Information Sheets and Safety Data Sheets (www.dow.com/products/market/packaging/product-line/saran-resins/product/saran-resins/)
- Contact Us (www.dow.com/packaging/contact/index.htm)
- SARAN™ PVDC Resins & Films and the Environment, The Dow Chemical Company, Form No. 190-00500 (http://msdssearch.dow.com/PublishedLiteratureDOWCOM/dh_007d/0901b8038007d391.pdf?filepath=plastics_eur/pdfs/noreg/190-00500.pdf&fromPage=GetDoc)

For more business information about SARAN resins, visit the Dow Performance Packaging web site at www.dow.com/products/market/packaging/product-line/saran-resins/product/saran-resins/.

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References

- ¹ SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Hazards Identification and Physical and Chemical Properties.
- ² SARAN™ PVDC Resins & Films and the Environment, The Dow Chemical Company, Form No. 190-00500-0305 SMG, March 2005, page 1.
- ³ SARAN™ PVDC Resins & Films and the Environment, The Dow Chemical Company, Form No. 190-00500-0305 SMG, March 2005, page 1.
- ⁴ SARAN™ PVDC Resins & Films and the Environment, The Dow Chemical Company, Form No. 190-00500-0305, March 2005, page 1.
- ⁵ SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Hazards Identification and Toxicological Information.
- ⁶ SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Ecological Information.
- ⁷ SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Hazards Identification, Stability and Reactivity.
- ⁸ "World Polyvinylidene Chloride Production," *Eurasian Chemical Manufacturing International Magazine*, www.chemmarket.info/en/home/article/1907/, accessed May 13, 2013.
- ⁹ SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Hazards Identification and Physical and Chemical Properties.
- ¹⁰ SARAN™ PVDC Resins & Films and the Environment, The Dow Chemical Company, Form No. 190-00500-0305 SMG, March 2005, page 1.
- ¹¹ SARAN™ PVDC Resins & Films and the Environment, The Dow Chemical Company, Form No. 190-00500-0305 SMG, March 2005, pages 1–3.
- ¹² SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Hazards Identification, Fire Fighting Measures, Accidental Release Measures, and Ecological Information.
- ¹³ SARAN™ PVDC Resins & Films and the Environment, The Dow Chemical Company, Form No. 190-00500-0305 SMG, March 2005, page 3.
- ¹⁴ SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Hazards Identification and Toxicological Information.
- ¹⁵ SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Ecological Information.
- ¹⁶ SARAN 168.01 Barrier Polymer Blend Material Safety Data Sheet, The Dow Chemical Company, October 9, 2007, Hazards Identification, Handling and Storage, and Stability and Reactivity.

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NOTICES

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

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