Product Safety Assessment

VITHANE™ Resins in Dimethylformamide

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Product Overview
• VITHANE™ resins in dimethylformamide (DMF) are a family of polyurethane elastomers manufactured and marketed by Rohm and Haas Company, a wholly owned subsidiary of The Dow Chemical Company, and its affiliated companies. “Elastomers” are resilient polymers that can bend or stretch and then return to their original shape. VITHANE resins in dimethylformamide are formulated as colorless to yellow, viscous liquids with an amine or ammonia-like odor.¹ For further details, see Product Description.
• VITHANE resins in dimethylformamide are used in the production of synthetic leather. Footwear, apparel, and furniture may be manufactured from synthetic leathers made with these VITHANE products.²³ For further details, see Product Uses.
• VITHANE resins are for commercial use. Worker exposure is possible during manufacture, transport, or application. Consumers may purchase finished goods, such as footwear or furniture, manufactured with VITHANE resins.⁴ For further details, see Exposure Potential.
• The following health information refers to the liquid resin formulations encountered during manufacturing. As resins cure (solidify), the carrier solvent is removed, and the resins form a flexible plastic film or “skin.” Eye contact with dimethylformamide vapor or mist during processing can cause moderate to severe irritation with temporary corneal injury. Skin contact with dimethylformamide may cause slight skin irritation. Dimethylformamide is

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harmful if absorbed through intact skin. Inhalation of dimethylformamide vapor or mist during processing may irritate the nose, throat, and lungs. Headache and nausea are also possible. For further details, see Health Information.

- Dimethylformamide, the solvent in these VITHANE™ products, is readily biodegradable, unlikely to accumulate in the food chain (bioconcentration potential is low) and is practically nontoxic to aquatic organisms on an acute basis. The polyurethane resins are expected to slowly degrade in the environment. Due to their high molecular weight, the resins are not expected to accumulate in the food chain, and they are not expected to be toxic to fish and other aquatic species. For further details, see Environmental Information.

- VITHANE resins in dimethylformamide are stable under recommended storage and normal use conditions. These products are combustible and should be stored away from ignition sources. Dimethylformamide vapor is heavier than air and can travel long distances and accumulate in low-lying areas. Ignition or flashback could occur. Avoid contact with oxidizing agents and halogenated compounds. For further details, see Physical Hazard Information.

**Manufacture of Product**

- **Locations** – A foreign affiliated company of Rohm and Haas Company, a wholly owned subsidiary of The Dow Chemical Company, produces VITHANE™ resins at facilities in Mozzate, Italy.

- **Process** – VITHANE resins in dimethylformamide are formulated in batch operations using proprietary Rohm and Haas materials and technology.

**Product Description**

VITHANE™ polyurethane resins in dimethylformamide are formulated as colorless to yellow viscous liquids with an ammonia-like or “fishy” amine odor. The dimethylformamide solvent is removed during processing to make consumer goods. Cured (solidified) VITHANE resins form strong flexible films or “skins” that are scratch-resistant and resistant to the attack of water. VITHANE polyurethane films or “skins” range from very soft and pliable to stiff to suit a wide variety of applications.

**Product Uses**

VITHANE™ resins in dimethylformamide are used as adhesives, basecoats, and topcoats in the production of synthetic leathers and in the textile industry. Synthetic leathers made with VITHANE resins are used for the following applications:

- Footwear (e.g., uppers for shoes and safety shoes)
- Upholstery – furniture (e.g., sofa), automotive (e.g., dashboard, gearshift, etc.)
- Apparel and accessories (e.g., handbags, belts, etc.)
- Bags, linings, general purpose
- Garments (e.g., labels, jackets, etc.)

**Exposure Potential**

VITHANE™ resins in dimethylformamide are used in the production of synthetic leather. Based on this, the public could be exposed through:

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• **Workplace exposure** – Exposure can occur in facilities that manufacture these resins, during transport, or during synthetic leather manufacture. VITHANE™ resins in dimethylformamide are produced, distributed, and stored in closed systems. Those working with VITHANE resins 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 exposure. See Health Information.

• **Consumer exposure to VITHANE resins in dimethylformamide** – These liquid resin formulations are not sold directly to consumers. Synthetic leather manufactured with VITHANE resins may be used to manufacture footwear, furniture, or other consumer goods. Consumers would contact only the cured resin, which is considered harmless. See Health Information.

• **Environmental releases** – Due to the use pattern for these VITHANE resins, releases to the environment are expected to be minimal. In the event of a spill, the focus is on immediate containment to prevent contamination of soil, surface water, or groundwater. If released, the dimethylformamide solvent is expected to biodegrade in water and soil environments, including biological wastewater-treatment facilities. The polyurethane resins will tend to float in water and will be removed in wastewater-treatment facilities by adsorption to biosolids. 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 with sand or soil to contain the spill. Evacuate personnel upwind and away from the spill or leak. Ground and bond all containers and handling equipment and extinguish all potential ignition sources. Clean-up personnel must wear appropriate personal protective equipment. Spilled product can create slippery conditions. Collect spilled product in suitable and properly labeled containers. See Environmental, Health, and Physical Hazard Information.

• **In case of fire** – Evacuate personnel and deny unnecessary entry. Use alcohol-resistant foam, carbon-dioxide or dry-chemical extinguishers, or a fine water spray or mist to fight the fire. A direct water stream may spread the fire. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Dimethylformamide vapor is heavier than air and can travel long distances and accumulate in low-lying areas. Ignition or flashback could occur. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, request the Safety Data Sheet from the Dow Customer Information Group.

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**Health Information**

Health information for VITHANE™ resins in dimethylformamide 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 products may contain minor components or additives with additional health risks. The Safety Data Sheet is the preferred source for specific information. The following health information refers to the polyurethane resin in dimethylformamide solvent encountered during manufacturing. The resulting fully cured polyurethane resin is a solid film or skin that is considered harmless.

**Eye contact** – Contact with dimethylformamide may cause moderate to severe irritation, tearing, pain, corneal opacity, or temporary corneal injury.

**Skin contact** – Contact with dimethylformamide liquid or vapor may cause slight irritation. Prolonged or repeated contact can cause reddening, swelling, and defatting or drying of the skin leading to irritation or dermatitis. Dimethylformamide is harmful if absorbed through intact skin.
with the potential for blood disorders or liver damage. Dimethylformamide absorbs readily through intact skin, therefore personal protective equipment must be worn while handling these products.

**Inhalation** – Inhalation of dimethylformamide vapor or mist during processing can cause irritation of the nose, throat, and lungs. Other symptoms may include headache, nausea, drowsiness, vomiting, or weakness. Excessive inhalation may result in liver damage, abdominal pain, blood disorders, and alcohol intolerance (facial flushing and palpitations).

**Ingestion** – These products may be harmful if swallowed. Ingestion of dimethylformamide can cause drowsiness, headache, nausea, dizziness, blood disorders, and liver damage.

**Chronic exposure** – Prolonged overexposure to dimethylformamide can cause liver damage. Dimethylformamide has been evaluated chronically in animals for cancer and the results have been mixed.

**Reproductive effects** – Reproductive and developmental toxicity have been observed, but generally in the presence of maternal toxicity in animals exposed to dimethylformamide.

For more information, request the Safety Data Sheet from the Dow Customer Information Group.

**Environmental Information**

Dimethylformamide, the solvent in these VITHANE™ formulations, is soluble in water and has low volatility. When introduced, the compound will tend to remain in water solution with minimal tendency to bind to soil and sediment. The polyurethane resins are not volatile and are insoluble in water. If released, the resins will float on water and eventually bind onto soil, suspended particles, or sediment.

Dimethylformamide is unlikely to persist in the environment. The solvent is readily biodegradable, which suggests that it will be removed from water and soil environments, including biological wastewater-treatment facilities. Although polyurethane resins are generally not considered biodegradable, they are likely to degrade slowly in the environment, including degradation by physical action or exposure to sunlight. The resins will likely be removed in wastewater-treatment facilities by adsorption to biosolids.

Dimethylformamide is unlikely to accumulate in the food chain (bioconcentration potential is low) and is practically nontoxic to fish and other aquatic organisms on an acute basis. Because of their high molecular weight, the polyurethane resins would not be expected to accumulate in the food chain (bioconcentration potential is low), and they are not expected to be toxic to fish and other aquatic organisms.

For more information, request the Safety Data Sheet from the Dow Customer Information Group.

**Physical Hazard Information**

VITHANE™ resins in dimethylformamide are stable under recommended storage and normal use conditions. These products are combustible and should be stored away from potential ignition sources. Dimethylformamide vapor is heavier than air and can travel long distances and accumulate in low-lying areas. Ignition or flashback could occur. Ground and bond all containers and handling equipment before transferring or using these products. Avoid contact with moisture, oxidizing agents, and halogenated compounds.
For more information, request the Safety Data Sheet from the [Dow Customer Information Group](http://www.dow.com/assistance/dowcig.htm).

### Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of VITHANE™ resins in dimethylformamide. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant [Safety Data Sheet](http://www.epa.gov/iris/subst/0511.htm), Technical Data Sheet, or Contact Us.

### Additional Information

- Request the relevant Safety Data Sheet from the [Dow Customer Information Group](http://www.dow.com/assistance/dowcig.htm)
- Contact Us ([www.dow.com/assistance/thoughts.htm](http://www.dow.com/assistance/thoughts.htm))
- VITHANE™ 654 One-Component Solvent-Based Aliphatic Polyurethane Top Coat, Edition No. 6, Technical Data Sheet, Rohm and Haas Europe Services APS, reviewed June 29, 2010
- VITHANE™ Resins Product Line Leaflet, ed 6, Rohm and Haas Europe Services, April 2011
- “Summary: N,N-Dimethylformamide (CASRN 68-12-2),” Integrated Risk Management System (IRIS) website, United States Environmental Protection Agency, Updated March 7, 2011

For more business information about VITHANE™ resins in dimethylformamide, contact the [Dow Customer Information Group](http://www.dow.com/assistance/dowcig.htm).

### References

3. VITHANE™ Resins Product Line, Edition No. 6, Rohm and Haas Europe Services, April 2011.
11. VITHANE™ Resins Product Line, Edition No. 6, Rohm and Haas Europe Services, April 2011.

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NOTICES:

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