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## Product Safety

### Product Safety Assessment (PSA): Propylene Glycol

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#### Names

CAS No. 57-55-6	1,2-Dihydroxypropane
Propylene glycol	Propane-1,2-diol
PG	1,2-Propanediol
	Monopropylene glycol
	MPG

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#### Product Overview

Propylene glycol (PG or MPG) is a colorless, odorless liquid<sup>1</sup> which is generally recognized as safe (GRAS) by the U.S. Food and Drug Administration (FDA) in 21 CFR § 184.1666, for use as a direct food additive under the conditions prescribed. It is approved by the U.S. FDA for certain indirect food additive uses.<sup>2</sup> PG is used in cosmetics and as an excipient (inert solvent or carrier) in pharmaceuticals. PG has a wide range of practical applications such as antifreezes, coolants and aircraft deicing fluids; heat transfer and hydraulic fluids; solvents; food; flavors and fragrances; cosmetics and personal care products; pharmaceuticals; chemical intermediates; plasticizers; and thermoset plastic formulations.<sup>3</sup> See [Product Uses](#).

PG is not acutely toxic (single dose, high exposure). It is essentially non-irritating to the skin and mildly irritating to the eyes. Numerous studies support that PG is not a skin sensitizer or a carcinogen.<sup>4</sup> See [Health Information](#).

Occupational and consumer exposure is possible because PG is used in a variety of consumer items. See [Exposure Potential](#).

PG is not volatile and is miscible with water. It is not expected to bio-accumulate and it is not acutely toxic to water organisms except at very high concentrations.<sup>5</sup> See [Environmental Information](#).

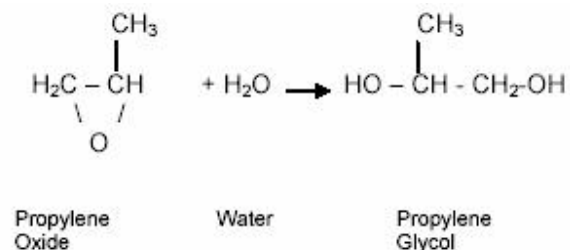
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#### Manufacture of Product

**Capacity** – Dow is the world's largest producer of propylene glycols, with about 35% of the

world's capacity. Dow has plants in the U.S. Germany, Brazil and Australia. Total world consumption of PG in 2003 was estimated at 2.6 billion pounds (1.2 million metric tons).<sup>6</sup>

**Process**<sup>7</sup>– Practically all commercial production of PG is by non-catalytic hydrolysis of propylene oxide using high temperatures and high pressures.



(Uncatalyzed reaction at 120-190°C at pressures of up to 21 atmospheres or 2170 kilo Pascals)

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## Product Description

PG is a colorless, odorless liquid. It is soluble to various extents in a wide range of organic materials, and is completely soluble in water.<sup>8</sup>

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## Product Uses

Dow markets two grades of PG to meet the requirements of the various applications. PG is used in a wide range of applications, including:<sup>9,10,11</sup>

### USP/EP grade:

Solvent in the flavor concentrate and fragrance industry, an excipient in elixirs and pharmaceuticals, and a coupling agent in sunscreens, shampoos, shaving creams and other personal care products

Wetting agent for natural gums to simplify compounding

Humectant, preservative and stabilizer in diverse applications.

### Industrial grade:

Raw material to produce high-performance unsaturated polyester resins (UPR) used for marine construction, gel coats, sheet molding compounds and synthetic marble castings

Chemical intermediate in the production of resins for paints and varnishes

Solutions with water to make antifreeze, heat-transfer fluids and aircraft and runway deicing fluids

Solvent in printing inks

Solvent and enzyme stabilizer in laundry detergents

Stabilizer in hydraulic fluids

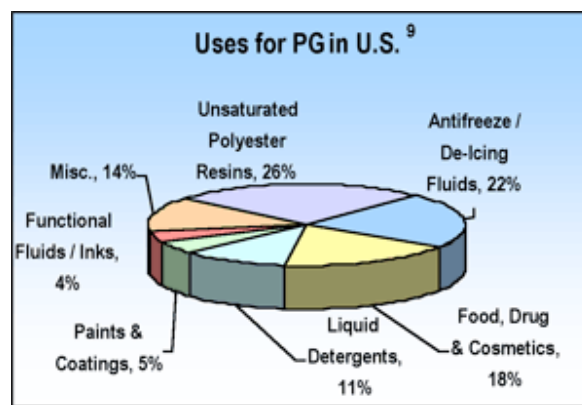
Plasticizer to improve the processability of plastics

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## Exposure Potential

PG is used in the production of consumer and industrial products. Based on the uses for PG, the public could be exposed through:

**Workplace exposure** – Exposure can occur either in a PG manufacturing facility or in the various industrial, commercial service or consumer settings that use PG. Because PG is not



acutely toxic and is not a sensitizer, low incidental exposures do not pose high health risks. However, each manufacturing, commercial service and consumer facility should have appropriate work processes and safety equipment policies in place to limit unnecessary PG exposure. Skin exposure is the most likely site for PG exposure in the work place; however in commercial service and consumer settings, use as a functional fluid or in deicing solutions presents a potential for inhalation exposure in addition to skin contact.<sup>12</sup> For more information on inhalation, see [Health Information](#).

**Consumer exposure to products containing PG** – Dow does not sell PG for direct consumer use, but it is used as a component in cosmetics, food additives, antifreeze, deicers, liquid detergents, etc. Consumers will likely have contact with PG. In general, exposure by ingestion is a result of the approved use of PG USP/EP grade in food, personal care and pharmaceutical products. Skin exposure, and to a lesser degree, inhalation exposure, are expected from the use of cosmetic products containing PG. Please review product labels and follow all instructions and guidelines for proper use to help prevent unnecessary exposure.<sup>13</sup> See [Health Information](#).

**Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil, surface or ground water. If PG does reach soil and water nearby, it is considered practically non-toxic to aquatic organisms and it biodegrades rapidly. If PG is present in a fire situation, it can produce toxic fumes. Proper protective equipment should be worn.<sup>14</sup> See [Environmental](#), [Health](#) and [Physical Hazard](#) Information.

**Large release** – Industrial spills or releases are infrequent and are generally contained. If a large spill does occur, the material should be captured, collected and re-processed, or disposed of according to applicable governmental requirements. If PG is exposed to a fire situation, it can decompose and release toxic fumes. Emergency personnel should wear proper protective equipment and follow emergency procedures carefully. When relevant in scale or risk, the community should be notified of the hazards associated with the specific release event. See [Environmental](#), [Health](#) and [Physical Hazard](#) Information.

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## Health Information

The toxicology database for PG has been reviewed and agreed upon by the Organization for Economic Co-operation and Development (OECD) SIAM<sup>15</sup> process. The oral toxicity of PG is low. In one study, rats were provided with feed containing as much as 5% PG over a period of 104 weeks and they showed no apparent ill effects.<sup>16</sup> Because of its low chronic oral toxicity, PG is generally recognized as safe (GRAS) for use as a direct food additive. Since 1942, it has been included in New and Non-Official Remedies as a proper ingredient for pharmaceutical products and it is listed in the United States Pharmacopoeia. It is also widely used and accepted as an ingredient in dental preparations.<sup>17</sup> PG is not approved for use in cat food.

Prolonged PG contact is essentially non-irritating to the skin. Undiluted PG is minimally irritating to the eye, and can produce slight transient conjunctivitis (the eye recovers after the exposure is removed). Exposure to mists may cause eye irritation, as well as upper respiratory tract irritation.<sup>18</sup> Inhalation of the PG vapors appears to present no significant hazard in ordinary applications. However, limited human experience indicates that inhalation of PG mists may be irritating to some individuals. Therefore inhalation exposure to mists of these materials should be avoided. In general, Dow does not support or recommend the use of PG in applications where inhalation exposure or human eye contact with the spray mists of these materials is likely, such as fogs for theatrical productions or antifreeze solutions for emergency eye wash stations.<sup>19</sup>

PG does not cause sensitization and shows no evidence of being a carcinogen or of being genotoxic.<sup>20</sup>

For more information on the health hazards of PG and recommended protective equipment, view the Safety Data Sheet.

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## Environmental Information

PG is not volatile, and is miscible with water. Concentrations of PG in the air are expected to be extremely low because of its low vapor pressure. It is readily biodegraded in water or soil (*via* aerobic and anaerobic mechanisms).

If a spill should occur, PG partitions almost equally in water and soil. Relatively little will go into the air because of its low vapor pressure. PG is not expected to bio-accumulate and is considered to be practically non-toxic to fish and aquatic invertebrates on an acute basis except at very high concentrations.

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## Physical Hazard Information

PG has a low vapor pressure and is not expected to volatilize. PG is stable unless elevated to high temperatures, at which point it can decompose. During a fire, smoke may contain the original material in addition to unidentified toxic and/or irritating compounds. Hazardous combustion products may include and are not limited to: aldehydes and carbon monoxide.

As with any liquid, spills can create slip hazards. Small spills should be cleaned up with absorbent material which should then be properly labeled and disposed of. Even though the toxicity of PG is low, PG should not be dumped into any sewer, on the ground or into any body of water. All disposal methods must be in compliance with all applicable governmental requirements.

PG should be stored in stainless steel, aluminum, Plasteel 3066-lined containers, 316 stainless steel, or opaque plastic containers. Product should not be stored in direct sunlight or at elevated temperatures. Avoid contact with oxidizing materials. Additional physical property information for PG is available on the [Safety Data Sheet](#).

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## Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use and/or disposal of PG. 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](#)

[A Guide to Glycols](#) brochure

United Nations Environment Program SIDS/ICCA Dossier [for Propylene Glycol](#)

Dow's Propylene Glycols web site

For more business information about PG, visit Dow's [Propylene Glycols](#) web site.

Last Updated: May 2, 2006



In order to view some information you may need to download Adobe Reader .

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## References

- <sup>1</sup> *Dow Propylene Glycol Industrial Safety Data Sheet* ([http://www.dow.com/PublishedLiterature/dh\\_0361/09002f1380361176.pdf?filepath=propyleneglycol/pdfs/noreg/117-01515.pdf&fromPage=GetDoc](http://www.dow.com/PublishedLiterature/dh_0361/09002f1380361176.pdf?filepath=propyleneglycol/pdfs/noreg/117-01515.pdf&fromPage=GetDoc)), No. 248, November 17, 2003, page 1.
- <sup>2</sup> [www.dow.com/propyleneglycol/about/safe.htm](http://www.dow.com/propyleneglycol/about/safe.htm)
- <sup>3</sup> [www.dow.com/propyleneglycol/about/index.htm](http://www.dow.com/propyleneglycol/about/index.htm)
- <sup>4</sup> *1,2-Dihydroxypropane SIDS Initial Assessment Profile* (<http://www.chem.unep.ch/irptc/sids/OECD/SIDS/57-55-6.pdf>), UNEP Publications, SIAM 11, U.S.A, January 23-26, 2001, page 3.
- <sup>5</sup> *1,2-Dihydroxypropane SIDS Initial Assessment Profile* (<http://www.chem.unep.ch/irptc/sids/OECD/SIDS/57-55-6.pdf>), UNEP Publications, SIAM 11, U.S.A, January 23-26, 2001, page 3.
- <sup>6</sup> *Chemical Economics Handbook Report Propylene Glycols*, SRI International, August 2004, Abstract.
- <sup>7</sup> Martin, Alton E., Murphy, Frank H., "Propylene Glycols," *Kirk-Othmer Encyclopedia of Chemical Technology 4<sup>th</sup> Edition*, Vol. 12, 1994, John Wiley & Sons, page 716.
- <sup>8</sup> *A Guide to Glycols* ([http://www.dow.com/PublishedLiterature/dh\\_02aa/09002f13802aaf25.pdf](http://www.dow.com/PublishedLiterature/dh_02aa/09002f13802aaf25.pdf)), page 28.
- <sup>9</sup> *1,2-Dihydroxypropane SIDS Initial Assessment Profile* (<http://www.chem.unep.ch/irptc/sids/OECD/SIDS/57-55-6.pdf>), UNEP Publications, SIAM 11,

U.S.A, January 23-26, 2001, page 4.

<sup>10</sup>*A Guide to Glycols*

([http://www.dow.com/PublishedLiterature/dh\\_02aa/09002f13802aaf25.pdf](http://www.dow.com/PublishedLiterature/dh_02aa/09002f13802aaf25.pdf)), page 28.

<sup>11</sup> [www.dow.com/propyleneglycol/about/index.htm](http://www.dow.com/propyleneglycol/about/index.htm)

<sup>12</sup>*1,2-Dihydroxypropane SIDS Initial Assessment Profile*

(<http://www.chem.unep.ch/irptc/sids/OECDSEIDS/57-55-6.pdf>), UNEP Publications, SIAM 11, U.S.A, January 23-26, 2001, page 11.

<sup>13</sup>*1,2-Dihydroxypropane SIDS Initial Assessment Profile*

(<http://www.chem.unep.ch/irptc/sids/OECDSEIDS/57-55-6.pdf>), UNEP Publications, SIAM 11, U.S.A, January 23-26, 2001, page 11.

<sup>14</sup> *Dow Propylene Glycol Industrial Safety Data Sheet*

([http://www.dow.com/PublishedLiterature/dh\\_0361/09002f1380361176.pdf?filepath=propyleneglycol/pdfs/noreg/117-01515.pdf&fromPage=GetDoc](http://www.dow.com/PublishedLiterature/dh_0361/09002f1380361176.pdf?filepath=propyleneglycol/pdfs/noreg/117-01515.pdf&fromPage=GetDoc)), No. 248, November

17, 2003, pages 1 and 5.

<sup>15</sup> SIAM stands for the SIDS (Screening Information Data Set) Initial Assessment Meeting.

<sup>16</sup> Gaunt, IF, Carpanini, FMB, Grasso, P and Lansdown, ABG, Long-term toxicity of propylene glycol in rats, *Food and Cosmetics Toxicology*, Apr. 1972, 10(2), pages 151 - 162.

<sup>17</sup> *A Guide to Glycols*

([http://www.dow.com/PublishedLiterature/dh\\_02aa/09002f13802aaf25.pdf](http://www.dow.com/PublishedLiterature/dh_02aa/09002f13802aaf25.pdf)), page 35.

<sup>18</sup> *Dow Propylene Glycol Industrial Safety Data Sheet*

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17, 2003, page 1.

<sup>19</sup> *A Guide to Glycols*

([http://www.dow.com/PublishedLiterature/dh\\_02aa/09002f13802aaf25.pdf](http://www.dow.com/PublishedLiterature/dh_02aa/09002f13802aaf25.pdf)), page 36.

<sup>20</sup> *1,2-Dihydroxypropane SIDS Initial Assessment Profile*

(<http://www.chem.unep.ch/irptc/sids/OECDSEIDS/57-55-6.pdf>), UNEP Publications, SIAM 11, U.S.A, January 23-26, 2001, page 21.

<sup>21</sup> *1,2-Dihydroxypropane SIDS Initial Assessment Profile*

(<http://www.chem.unep.ch/irptc/sids/OECDSEIDS/57-55-6.pdf>), UNEP Publications, SIAM 11, U.S.A, January 23-26, 2001, pages 3 and 15.

<sup>22</sup> *Dow Propylene Glycol Industrial Safety Data Sheet*

([http://www.dow.com/PublishedLiterature/dh\\_0361/09002f1380361176.pdf?filepath=propyleneglycol/pdfs/noreg/117-01515.pdf&fromPage=GetDoc](http://www.dow.com/PublishedLiterature/dh_0361/09002f1380361176.pdf?filepath=propyleneglycol/pdfs/noreg/117-01515.pdf&fromPage=GetDoc)), No. 248, November

17, 2003, pages 2-4 and 6.

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