Product Safety Assessment

*DOW™* Low Density Polyethylene (LDPE) Resins

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**Names**
- CAS No. 9002-88-4
- *DOW™* low density polyethylene resin
- Low density polyethylene resin
- LDPE
- Polyethylene
- Ethene, homopolymer
- Ethylene, homopolymer
- Polythene

**Product Overview**
- *DOW™* low density polyethylene (LDPE) resins are polymers made from ethylene (ethene). These resins have good clarity, good moisture and gas barrier properties, can be heat-sealed, and are strong and flexible.¹ For further details, see **Product Description**.
- *DOW LDPE resins are manufactured as odorless white pellets or granules.²** The pellets are used in industrial fabrication processes such as blown and cast film, extrusion coatings, and injection molding. The resins are mainly used to manufacture films for packaging applications. Fresh milk and juice cartons are made with paperboard coated with LDPE film, making the cartons leak-proof. LDPE resins are also molded into durable products from power cables to toys.³ For further details, see **Product Uses**.
- Eye contact with low density polyethylene resins or dusts may cause irritation or corneal injury due to mechanical action (scratching). Vapor from the heated resin may cause mild discomfort and redness of the eyes or respiratory irritation. These resins are often processed as molten polymer at elevated temperatures. Contact with the heated resin may cause burns.⁴ For further details, see **Health Information**.
- Because LDPE resins are used extensively in food packaging and consumer products, consumer contact is likely. Resins used for food contact are in compliance with applicable U.S. Food and Drug Administration (FDA) regulations and European Union (EU) directives/regulations. Workplace exposure is also possible. For further details, see **Exposure Potential**.
- Spilled LDPE resins can create an industrial slipping hazard. For further details, see **Physical Hazard Information**.

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Created: June 22, 2009
Manufacture of Product

- **Capacity** – The 2006 world production of LDPE was estimated at 38.1 billion pounds (17.3 million metric tons). Dow manufactures LDPE at facilities in Freeport and Seadrift, Texas; Plaquemine, Louisiana; Bahia Blanca, Argentina; Leuna, Germany; Tarragona, Spain; and Terneuzen, The Netherlands.

- **Process** – Two types of reactors are used to produce DOW™ LDPE resins; the continuous-flow stirred autoclave, and the tubular reactor. Pure ethylene gas is reacted under high pressure in the presence of a peroxide reaction initiator. Ethylene reacts with itself forming a polymer and generating a large amount of heat. The molten polyethylene is cooled and extruded to form pellets.

Product Description

DOW™ LDPE resins are odorless white pellets or granules. These resins are thermoplastics made from ethylene with the repeating unit (–CH₂–CH₂–)ₙ. They are stiff plastics but lack hardness and brittleness and have a somewhat waxy feel. LDPE resins are characterized by molecular weight, density, and melt index (MI, a measure of flow rate under prescribed conditions of temperature and pressure). DOW LDPE resins can be blended with linear low density (LLDPE) or high density polyethylene (HDPE) resins to tailor the physical characteristics for specific products.

Product Uses

DOW™ LDPE resins are used in the following industrial fabrication processes:

- **Film** (blown and cast) – Applications include food packaging (baked goods, dairy products, frozen food, produce, meat and poultry, candy, and cookies); and nonfood packaging (industrial liners, heavy-duty sacks, multi-wall sack liners, pallet stretch- and shrink wrap, bundling and over-wrap, grocery sacks, merchandise bags, and garment bags). Films used for food packaging applications are compliant with U.S. Food and Drug (FDA) and European food contact regulations. Typical non-packaging uses include household wrap and bags, garbage bags, industrial sheeting and roll stock, agricultural film and disposable diaper backing.

- **Extrusion coatings** – the coating of paper and paperboard products for packaging liquids such as milk and juices, the coating of foil to provide a heat-seal layer, and the coating of paper and woven cloth to provide a moisture barrier.

- **Injection molding** – Applications include toys, housewares, and lids, caps, and closures for containers.

- **Wire and cable** – Applications include insulation and jacketing for a variety of wire and cable products.
• **Adhesives and sealants** – Specialty formulated products such as adhesives, cosmetics, textile coatings and finishing agents, inks, polishes, and polymer processing aids are made using LDPE.

• **Blow molding** – Squeeze bottles for adhesives, toiletries, and personal-care products; household chemical containers; liquid food bottles; industrial drums; toys; and pharmaceutical containers are made from molded LDPE.

• **Sheet** – Rigid and flexible sheeting used to line sanitary or water-retention ponds; thermoformed and vacuum-formed products; and laminated paper, textiles, and films are made using LDPE.

Exposure Potential

DOW™ LDPE resins are not sold directly to consumers, but are used extensively in consumer and industrial products. Based on the uses for these resins, the public could be exposed through:

• **Workplace exposure** – Exposure can occur in a manufacturing facility that makes these resins or in fabrication facilities that use these resins. Those working with LDPE resins could be exposed during maintenance, sampling, testing, or other procedures. Good housekeeping practices and control of resin dust are necessary for safe handling of these products. Each facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary exposure. See Health Information.

• **Consumer exposure to products containing LDPE** – LDPE resins are fabricated into many consumer products as well as packaging. It is likely everyone uses plastic products or handles packaging made with LDPE or LDPE blends daily. Plastics can contain residual or unreacted quantities of monomers and process additives such as antioxidants. These materials are tightly controlled to maintain levels below regulatory limits. The U.S. Food and Drug Administration (FDA) as well as European Union food-contact regulatory authorities, recognizing the potential for small amounts of substances used to make plastics to migrate to food, closely regulate the substances used to make plastic containers and materials like wraps that come into contact with food. During the approval process, these authorities consider the migration of substances added to regulated plastics and their toxicological properties to assure that the use is well within the margin of safety. The authorities evaluate plastics and the additives used in them at the temperatures under which containers or wraps made from the plastic are likely to encounter during ordinary use. This would include temperatures expected during the use of materials to heat or reheat food in microwave ovens. For more information on the use of plastics in microwave ovens please visit the "Microwaving with Plastics," section of the Plastics Division of the American Chemical Council’s PlasticsInfo.org website. See Health Information.

• **Environmental releases** – Products made from these resins are plastics that are expected to be inert in the environment. Industrial spills or releases are infrequent and generally contained. In the event of a spill, the focus is on containing the spill to prevent contamination of soil, ditches, sewers, waterways, or groundwater. If a large spill does occur, contain the spilled material if possible. Sweep up and collect the recovered material in suitable and properly labeled containers. Use appropriate safety equipment. Consult the relevant Safety Data Sheet for more information.

• **In case of fire** – Keep people away and deny unnecessary entry. Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. If protective equipment is not available, fight the fire from a protected location or safe distance. Use water fog or fine spray, dry-chemical or carbon-dioxide fire extinguishers, or foam. **Do not use a**
direct water stream on molten material. Cool surroundings with water to localize the fire zone. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, see the Safety Data Sheet.

Health Information

DOW™ LDPE resins used for food-contact applications are in compliance with applicable U.S. Food and Drug Administration (FDA) regulations and EU directives/regulations for consumer safety.

**Eye and Skin Contact** – Eye contact with LDPE resins or dust may cause irritation or corneal injury due to mechanical action (scratching). Vapor from the heated resin may cause mild discomfort and redness of the eyes. Prolonged skin contact is essentially nonirritating. These materials are often processed as molten polymers at elevated temperatures and skin contact with the heated material may cause burns.

**Inhalation** – No adverse effects are anticipated from a single exposure to dust. Vapors or fumes released during thermal processing may cause respiratory irritation.

**Ingestion** – These materials have very low toxicity if swallowed. However, the granules may represent a choking hazard.

For specific health information, review the Safety Data Sheet.

Environmental Information

LDPE resins are expected to be inert in the environment. They float on water and are not biodegradable. They are not expected to bioconcentrate (accumulate in the food chain) due to their high molecular weight. LDPE pellets or granules are not expected to be toxic if ingested, but may represent a choking hazard if ingested by waterfowl or aquatic life.

Additional environmental information is available on the Safety Data Sheet.

Physical Hazard Information

Spilled LDPE resins can create an industrial slipping hazard. Pneumatic conveying and other mechanical handling operations can generate combustible dust. Prolonged exposure to elevated temperatures can cause these resins to decompose. At temperatures exceeding melt temperatures, polymer fragments can be released. Fumes can be irritating. Decomposition products include aldehydes, alcohols, organic acids, trace amounts of hydrocarbons, and other compounds.

Additional physical hazard information is available on the Safety Data Sheet.
Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of LDPE resins. 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 (http://www.dow.com/webapps/msds/msdssearch.asp)
- Contact Us (http://plastics.dow.com/plastics/na/contact/)
- Technical Data Sheet (www.plastics.dow.com/ – select the desired geographic area and the relevant product using the product finder)
- DOW Polyethylene 722 Technical Data Sheet (extrusion coating), The Dow Chemical Company, Form No. 305-01135-0805X, August 2005 (http://www.dow.com/PublishedLiterature/dh_00f7/0901b803800f7e4e.pdf?filepath=plastics_na/pdfs/noreg/305-01135.pdf&fromPage=GetDoc)

For more business information about DOW™ LDPE and other polyethylene resins, visit the Dow Plastics website: http://plastics.dow.com/plastics/.

References

NOTICES:

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