

EXPANDABLE POLYSTYRENE

Product Summary

Expandable Polystyrene (EPS) is a common, solid plastic formed by combining polystyrene¹ with a blowing agent (pentanes). NOVA Chemicals' EPS resin is a small, white bead, approximately 0.25 – 2.0 mm diameter, that contains up to 8% of a mixture of various pentanes (normal, cyclo- and/or iso-). NOVA Chemicals manufactures three principal types of EPS resin:

- regular grades - our general-purpose EPS resin
- modified grades - EPS resin that contains a specially formulated flame retardant
- specialty EPS resins - includes our low pentane products, as well as DYLITE® EPS.

NOVA Chemicals manufactures these EPS resins at its Beaver Valley (Monaca), Pennsylvania, and Painesville, Ohio facilities. EPS is shipped domestically and internationally in bulk bags and cartons, via standard truckload box trailers and marine containers.

Product Use Information

EPS resins are used in a variety of applications:

- building and construction applications (insulation, structural insulated panels, insulating concrete forms, roofing insulation systems, sheathing and decorative moldings/specialty trims)
- protective packaging for consumer goods (thermal protective produce, fish and pharmaceuticals boxes),
- recreational equipment and toys

NOVA Chemicals specialty DYLITE® EPS, is used for food packaging (products such as foam drinking cups, meat trays, noodle bowls, takeout containers and ice cream containers). Our customers use steam to release the pentane in the EPS resins, resulting in a “puffy” material that is then molded into foam articles.

Human Exposure

Due to its use in a variety of consumer products, the general public is exposed to finished EPS foam products. Workers processing the raw EPS resins are also exposed during the manufacturing processes. EPS resins and foam products have been extensively reviewed by regulatory authorities and deemed safe for consumer use. Regulatory agencies determined that EPS resins are not hazardous by normal routes of exposure including skin contact, inhalation and ingestion.

Although NOVA Chemicals' EPS is considered to be non-toxic, workers producing or processing the product can be exposed to pentane and styrene vapors, and resin dusts. Hydrogen bromide can be released during processing of our modified grades of EPS. Therefore, appropriate safety management systems during manufacturing, processing, cutting, fabrication, finishing and recycling operations are required. Good equipment design, adequate ventilation, proper handling and personal hygiene procedures minimize workplace exposures.

The public is exposed to expanded (or foam) polystyrene from everyday use of many consumer products made from EPS resins. Swallowing small EPS plastic items can cause choking. With respect to exposure to foam EPS food service materials, the Society of the Plastics Industry and the American Chemistry Council completed many rigorous tests. Testing protocols and results were submitted to the FDA, and demonstrate that the maximum amount of styrene and other substances that could migrate from the EPS food packaging is very small and was not found to present health and safety concerns. The Harvard Center for Risk Assessment (scientists with expertise in toxicology, epidemiology, medicine, risk analysis, pharmacokinetics, and exposure assessment) concluded “there is no cause for concern for the general public from exposure to styrene from foods or styrenic materials used in food-contact applications, such as polystyrene packaging and foodservice containers.”³

Health Information

Based on thorough evaluation of human toxicological data for polystyrene, this product is considered to pose a low risk under intended use conditions. In workplace processing of EPS resins, contact with fine dusts and heated fumes may cause eye, skin, and respiratory system irritation. Contact with hot, molten material may cause severe thermal burns, possible permanent injury or blindness. Inhalation of smoke under fire conditions is considered hazardous. EPS resin

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contains low amounts of a pentane blowing agent (3- 8%). The American Conference of Governmental Industrial Hygienists (ACGIH), the US Occupational Safety and Health Administration (OSHA) and the National Institute for

Occupational Health (NIOSH) have set the worker exposure limits for pentane ranging from 120 to 600 parts per million averaged over 8-hours of work or a 40-hour workweek. Pentane can irritate eyes, skin and the respiratory system.

Environmental Exposure

The presence of EPS foamed articles in the environment is caused by litter. The presence of EPS resins (beads) in the industrial workplace/transport environment is caused principally by poor housekeeping. Once in the environment, EPS is persistent in land and water systems. EPS resins and foamed articles will not biodegrade readily in the environment unless first chemically modified by heat or chemical action to reduce the molecular size. Exposure to sunlight will produce increasing amounts of degradation causing the plastic to break down slowly over time. EPS resins and foam products can be collected and recycled. Discarded foam products can be disposed of in public landfills, as they do not break down into hazardous gases or other toxic compounds. Waste resins and foam products can also be recovered and used as a high-energy fuel in industrial thermal energy recovery systems.

Ecological Information

EPS resins and foamed articles are considered non-toxic in land and water systems. EPS resins and foamed articles are not readily digestible; and may accumulate in the digestive systems of some sea birds and marine life causing possible death by starvation. EPS resins and foamed articles do not degrade in soil or in landfill and should be fully recovered from land spills.

Physical Hazards

The principal safety hazard associated with transporting, storing, handling and processing EPS is fire. EPS resins and newly foamed articles contain pentane, a flammable gas. The pentane evaporates from the EPS resins during storage and processing and from molded products at different rates. The United Nations Subcommittee on the Transport of Dangerous Goods and the U.S. Department of Transportation have classified EPS resin as a hazard class 9 (miscellaneous hazard) and has assigned a material identification number of 2211 (polymeric beads, expandable, evolving flammable vapor).⁴

Pentane vapors are colorless and weigh approximately 2½ times more than air. The vapors can be ignited with low intensity ignition sources, such as matches, lighters, lit cigarettes; heaters and stoves; exhaust from forklifts; and static electricity. Therefore, when handling EPS resin, all ignition sources, including static sparks, must be eliminated and pentane vapor accumulation in low-lying areas must be prevented.

EPS resins and foamed articles are inert and chemically neutral materials. All of our EPS resins and foamed articles will burn if overheated to high temperatures and can emit a heavy, irritating smoke similar to that produced by burning wood. Our modified grades of EPS contain brominated flame retardants which decrease the rate of flame spread during a fire. During a fire, hydrogen bromide can be released from these modified EPS resins and foamed articles.

Build-up of fine dust may create an explosive mixture with air. In view of this, precautions should be taken to prevent the buildup of static electricity and contact with electrostatic discharges in industrial processing. Spilled product may cause a slipping hazard. Industrial workers should avoid walking on top of deep piles of plastic pellets in storage vessels or in any contained area to avoid risk of falling and possible suffocation.

Risk Management at NOVA Chemicals

NOVA Chemicals continues to carefully review all relevant information on the safety and suitability of our EPS resins for their known and intended end-uses. In addition, our EPS resins are constantly being improved and tailored to meet the ever-changing needs of our customers.

NOVA Chemicals is committed to sharing information on the safe handling and end-use of our products with customers and other interested parties. Material Safety Data Sheets (MSDS) are provided to our customers and can be accessed by interested members of the public electronically via our website at www.novachemicals.com. NOVA Chemicals has created a dedicated webpage for EPS resins that contains significant product care information and literature, including safety, health and environmental information sheets, Storage and Handling Safety Guides, and technical processing information at: <http://www.novachem.com/EPS/index.cfm>

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NOVA Chemicals is a member of The Plastics Division of the American Chemistry Council and the Canadian Plastics Industry Association. Through these and other industry associations, we actively monitor and participate in public regulatory processes impacting EPS products. We also seek to better understand and support sustainable solutions to plastic recycling and other health and environmental challenges. We actively support industry-sponsored product testing initiatives and other industry initiatives supporting responsible actions, sound science and life cycle stewardship of our products.

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For detailed information on this product, please review the product Material Safety Data Sheet (MSDS). In the case of an emergency involving this product, please call our 24-hour hotline at 1-800-561-6682 or 1-403-314-8767.

For additional information on this product risk profile, please contact us at 1-412-490-4063 or email us at STEWARDP@novachem.com.

For more information on any NOVA Chemicals' product, please contact us at the nearest location below during business hours or visit our website at www.novachemicals.com:

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Footnotes:

1. Polystyrene is a clear-to-white, solid plastic product made by reacting molecules of styrene² into long polymer chains in carefully controlled manufacturing processes. Polystyrene was first discovered in 1839 as an isolated substance from natural resins, and was first commercially synthesized in 1930.
2. Styrene is a clear, colorless liquid that is derived from petroleum and natural gas by-products. Styrene also occurs in the environment and is found in many common foods, such as coffee, strawberries and cinnamon. Additional information on styrene can be found at: www.styrene.org
3. "A Comprehensive Evaluation of the Potential Health Risks Associated with Occupational and Environmental Exposure to Styrene", Harvard Center for Risk Analysis, Harvard School of Public Health, Boston, MA (Journal of Toxicology and Environmental Health, Volume 5, Number 1-2, January – June 2002), published quarterly by Taylor & Francis.
4. Code of Federal Regulations, Title 49.