Product Stewardship Summary

Acrylamide

General Statement

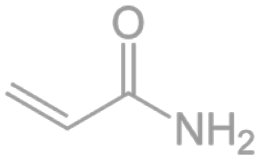
Acrylamide is an odorless, white crystalline solid. It is produced from the hydration of acrylonitrile and sulfuric acid followed by neutralization. It is used to make polyacrylamides, which are used as flocculants, strengthening agents and grouting agents. Polyacrylamides are also used in biomedical research. Acrylamide is a component of tobacco smoke and is naturally formed during the cooking of foods high in carbohydrates (particularly potatoes).

Exposure to levels of acrylamide typically found in the natural environment is not expected to be harmful to human health or the environment. There is some concern that consuming acrylamide that can be formed when cooking certain high carbohydrate foods may be harmful. Acrylamide in work environments may cause adverse worker health effects if exposure is not adequately controlled. Exposure controls in the workplace serve to prevent adverse health effects to workers. Exposure to consumers can be controlled by proper labelling and warnings on the consumer products.

Ashland produces, purchases and sells acrylamide. Ashland produces acrylamide in Germany and Russia and also purchases acrylamide from both US and international manufacturers. Ashland both directly sells acrylamide and uses acrylamide to produce polyacrylamide polymers. Ashland uses acrylamide to manufacture multiple products in the Conditioneze™, N-Hance™ and other product lines.

Chemical Identity

Name: Acrylamide
Brand Names: Multiple products in the Conditioneze™, N-Hance™, and other lines
Chemical name (IUPAC): Prop-2-enamide
CAS number(s): 79-06-1
ES number: 201-173-7
Molecular formula:C3H5NO
Structure:



Uses and Applications

The majority of acrylamide is used to manufacture various polymers. Polyacrylamides are used in molecular biology laboratories in polyacrylamide gel electrophoresis to separate charged molecules.

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Additionally, acrylamide is used as a binding, thickening or flocculating agent in grout, cement,

sewage/wastewater treatment, pesticide formulations, cosmetics, sugar manufacturing, soil erosion prevention, ore processing, food packaging, plastic products, and paper production.

Ashland's polyacrylamides are used as flocculants (used to separate solids from aqueous solutions in sewage, wastewater treatment and mining operations) and in the pulp and paper industry to provide dry strength to paper and paperboard.

Physical/Chemical Properties

Phys/Chem Safety Assessment

Acrylamide is typically handled as an aqueous solution to prevent auto-polymerization.

Property	Value
Form	Crystalline
Physical state	Solid
Color	White
Odor	Odorless
Density	1.12 g/cm^3 @ 30°C
Melting / boiling point	84.5 °C / 125 °C at 3.33 kPa
Flammability	Combustible solid
Explosive properties	Not explosive
Self-ignition temperature	424 °C
Vapor pressure	0.9 Pa @ 25°C
Mol weight	71.08 g/mol
Water solubility	371.1 g/L @ 20°C
Flash point	138 °C
Octanol-water partition coefficient (Logk_{ow})	-0.9 @ 20°C

Exposure, Hazard and Safety Assessment

The following section describes possible exposures scenarios and hazards associated with acrylamide. The exposure assessment describes both the amount of and the frequency with which a chemical substance reaches a person, a population of people, or the environment. Hazard refers to the inherent properties of a substance that make it capable of causing harm to human health or the environment. The safety assessment reports the possibility of a harmful event arising from exposure to a chemical or physical agent under specific conditions. Just because a substance may possess potentially harmful properties does not mean that it automatically poses a risk. It is not possible to make that determination without understanding the exposure.

Human Health Effects

Human Exposure Assessment

The principal routes of acrylamide exposure for the general population are by drinking water, inhaling tobacco smoke and eating foods containing acrylamide. Acrylamide in the diet is the result of its formation from naturally-occurring components of certain foods when cooked at high temperatures, such as french fries and potato chips. Acrylamide is not present in any ingredient of these foods prior to cooking and it is not a contaminant inadvertently added at any stage of food preparation. The highest concentrations of acrylamide found in foods have been reported in potato chips and french fries; it has also been found in breakfast cereals, pastries and cookies, breads, rolls and toast, cocoa products, coffee and coffee substitutes. Levels in these foods, however, are typically lower than those found in potato chips and french fries. Human exposure from environmental media such as drinking water, inhaling air and using consumer products is very low in comparison to intake from food or

from smoking.

Consumer: Consumer exposure is most likely limited to extremely low levels of residual monomer present within the polymers used in consumer products.

Worker: In industrial settings, acrylamide is manufactured and handled in closed processes as much as possible, which ensures that worker exposure to acrylamide is minimized. The principal route of acrylamide exposure for the workers is via air. Air contamination levels in the workplace are due to handling, storing and processing of styrene and styrene-containing polymers. The proper use of personal protective equipment during loading, unloading, sampling or maintenance operations will further minimize potential exposures to acrylamide.

Human Hazard Assessment

Acrylamide has moderate acute toxicity if ingested orally, applied on skin or inhaled. Exposure may cause nose, and throat irritation. Acrylamide exposure may cause severe skin and eye irritation, and may cause allergic reactions upon contact with skin. Prolonged or repeated exposure to acrylamide may damage the peripheral nervous system, causing muscle weakness, numbness/weakness in the hands and feet, sweating, discoloration/peeling of skin, unsteadiness and clumsiness. Acrylamide is toxic to the genetic system and is suspected of causing cancers. Acrylamide is also suspected of damaging reproductive performance and unborn children.

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	Moderate acute toxicity if ingested orally, applied on skin or inhaled
Irritation / corrosion Skin / eye / respiratory test	Causes severe skin and eye irritation. Does not cause respiratory irritation.
Sensitization	Causes allergic reactions upon contact with skin
Toxicity after repeated exposure Oral / inhalation / dermal	Prolonged or repeated exposure can damage peripheral nervous system
Genotoxicity / Mutagenicity	Can cause genetic defects
Carcinogenicity	May cause cancer
Reproductive/Developmental Toxicity	Suspected of damaging reproductive performance and unborn children
Aspiration hazard	Not applicable

Human Health Safety Assessment

Consumer: Consumer exposure to acrylamide from industrial sources is low compared to that from foods and smoking. Consumers are unlikely to come into contact with harmful levels of acrylamide, as acrylamide monomer is found only in trace quantities in consumer products. However, use of appropriate handling and disposal methods will ensure that consumer exposure, and the subsequent risk associated with the use of products containing acrylamide, is unlikely.

Worker: In industrial settings, the risks associated with acrylamide exposure are handled primarily by sufficient ventilation, proper handling and storage techniques which limit exposure. Additionally, acrylamide is handled primarily in closed and continuous processes which limit worker exposure. Based on the implementation of good manufacturing processes and industrial hygiene practices, the occupational health risk associated with acrylamide can be efficiently controlled.

Environmental Effects

Environmental Exposures

Environmental exposure to acrylamide is anticipated to be minimal, as acrylamide quickly degrades. Minimal environmental exposure may occur due to occasional releases of acrylamide from industrial processes or consumer disposal of consumer products containing trace amounts of acrylamide.

Environmental Hazard Assessment:

Acrylamide is readily biodegradable and has low potential for bioaccumulation. Acrylamide is considered harmful for aquatic life.

Effect Assessment	Result
Aquatic toxicity	Harmful to aquatic organisms

Fate and behavior	Result
Biodegradation	Readily biodegradable
Bioaccumulation potential	Substance does not bioaccumulate (BCF = 1.65)
PBT / vPvB conclusion	This substance is not considered to be persistent, bioaccumulating and toxic (PBT) or very persistent and very bioaccumulating (vPvB)

Environmental Safety Assessment

Although acrylamide is toxic to aquatic life on the short Any such releases of acrylamide will be rapidly degraded by microorganisms. Overall, acrylamide is not considered to be PBT or vPvB.

Risk Management Recommendations

Exposure to acrylamide can be controlled by implementing sufficient ventilation and proper handling and storage techniques. Examples of such techniques include: a ventilation system, proper protective equipment such as eye protection (i.e., splash proof goggles), normal work clothing that covers arms and legs, resistant gloves, and NIOSH-approved respirators in situations where exposure exceeds allowable exposure limits and/or ventilation alone is not sufficient, as recommended in the SDS for this substance.

Consumer products are not anticipated to contain significant levels of acrylamide. However, consumers should always follow all handling instructions and warning labels provided by the manufacturer.

National, state and local governments regulate potential exposures. For example, the US EPA requires acrylamide levels in drinking water to be less than 0.5 ppb. Similarly, the US FDA limits exposure to acrylamide in food packaging. The regulatory limits are established to protect the health and environment of the community.

The Health Canada has implemented a risk management strategy to minimize exposure to acrylamide through the diet. This approach has included encouraging the food industry to develop and implement acrylamide reduction strategies, regularly updating and distributing consumption advice, and coordinating risk management efforts for acrylamide in food with key international food regulatory partners.

Exposure to acrylamide in the workplace is covered by established occupational exposure limits. A partial list of references follows:

US OSHA PEL: 0.3 mg/m3 (8h TWA)

ACGHI TLV: 0.03 mg/m3 (8h TWA)
EU and member states: 0.3 mg/m3 (UK, France), 0.03 mg/m3 (Belgium, Ireland, Austria, Denmark, Finland, Spain Sweden), 0.03 mg/m3 (Switzerland (inhalable aerosol)), 0.07 mg/m3 (Germany AGS, inhalable aerosol), 0.61 (Netherlands) (8h TWA)
Canada: 0.03 mg/m3 (8h TWA)
China: 0.3 mg/m3 (8h TWA)

Regulatory Agency Review

Acrylamide is identified in the following lists:

- Taiwan Chemical Substance Inventory (TCSI)
- Australia Inventory of Chemical Substances (AICS)
- Canadian Domestic Substances List (DSL)
- China. Inventory of Existing Chemical Substances in China (IECSC)
- ECHA List of Publishable Substances Registered
- European Inventory of Existing Commercial Chemical Substances (EINECS)
- Japan. ENCS - Existing and New Chemical Substances Inventory
- Korea. Korean Existing Chemicals Inventory (KECI)
- New Zealand. Inventory of Chemical Substances
- Philippines Inventory of Chemicals and Chemical Substances (PICCS)
- Switzerland. New notified substances and declared preparations
- United States TSCA Inventory
- Japan. ISHL - Inventory of Chemical Substances

Regulatory Information / Classification and Labeling

Under the Globally Harmonized System for classification and labeling (GHS), substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the (Extended) SDS. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

GHS Classification:

Acute toxicity (Oral) - Category 3
Acute toxicity (Inhalation) - Category 4
Acute toxicity (Dermal) - Category 4
Skin corrosion/irritation - Category 2
Serious eye damage/eye irritation - Category 2A
Skin sensitization - Category 1
Germ cell mutagenicity - Category 1B
Carcinogenicity - Category 1B
Reproductive toxicity - Category 2
Specific target organ toxicity - repeated exposure - Category 1 (Peripheral nervous system)
Acute aquatic toxicity - Category 3

Hazard Statements:

H301: Toxic if swallowed.
H312 + H332: Harmful in contact with skin or if inhaled.
H315: Causes skin irritation.
H317: May cause an allergic skin reaction.
H319: Causes serious eye irritation.
H340: May cause genetic defects.
H350: May cause cancer.
H361: Suspected of damaging fertility or the unborn child.

H372: Causes damage to organs through prolonged or repeated exposure.
H402: Harmful to aquatic life.

Signal Word:

Danger

Precautionary Statements:

P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P260: Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264: Wash skin thoroughly after handling.
P270: Do not eat, drink or smoke when using this product.
P271: Use only outdoors or in a well-ventilated area.
P272: Contaminated work clothing should not be allowed out of the workplace.
P273: Avoid release to the environment.
P280: Wear protective gloves/ protective clothing/ eye protection/ face protection.

Hazard Pictograms:

Conclusion

Acrylamide is used in numerous manufacturing processes and final product formulations. When handled responsibly, the potential health effects of acrylamide can be minimized, allowing consumers and workers to use materials containing acrylamide safely.

Contact Information with Company

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Additional Information

For more information on GHS, visit http://www.osha.gov/dsg/hazcom/ghsguideoct05.pdf or

http://live.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html.
Ashland product stewardship summaries are located at
http://www.ashland.com/sustainability/product/product-stewardship

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Inclusion on the New Zealand Inventory of Chemicals applies only to the pure substance listed. The importer of record must determine whether or not their substances are in compliance.