Product Stewardship Summary
Acrylamide

Acrylamide is an odorless, white or colorless, solid. 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 produced from the hydration of acrylonitrile and sulfuric acid followed by neutralization. Acrylamide is also 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. Acrylamide in work environments may cause adverse health effects in workers if exposure is not adequately controlled. There is some concern that consuming acrylamide, that is sometimes formed when cooking certain high carbohydrate foods, may be harmful.

Chemical identity:

NAME: Acrylamide
CAS#: 79-06-1
SYNONYMS: Propenamide, acrylic amide and akrylamid
TRADE NAMES OF ASHLAND PRODUCTS CONTAINING FORMALDEHYDE: Praestol, Perform, Infinity, Hercobond

Uses:
Ashland produces acrylamide in Germany and Russia and also purchases acrylamide from both US and international manufacturers. Ashland uses acrylamide to produce polyacrylamide. Ashland 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:
Acrylamide:

- is a white or colorless solid
- Is odorless
- is soluble in polar solvents such as water, ethanol and acetone

Health Effects:
Exposure of humans to acrylamide may result in eye, skin, nose, and throat irritation. Repeated exposure to high levels of acrylamide over the course of weeks to months in occupational settings can result in effects on the nervous system such as muscle weakness, numbness/weakness in the hands and feet, sweating, discoloration/peeling of skin, unsteadiness and clumsiness. These effects disappear after exposures were stopped.

Based on results from animal testing, acrylamide has been shown to reduce the ability of males to produce offspring and has caused effects to the nervous system of fetuses.

The International Agency for Research on Cancer (IARC) has determined that acrylamide is probably carcinogenic to humans.

The following websites provide additional information on the potential health effects of acrylamide:

- Agency for Toxic Substances and Disease Registry http://www.atsdr.cdc.gov/toxprofiles/tp203.html
- US EPA Integrated Research Information Center http://www.epa.gov/ncea/iris/subst/0286.htm
- International Agency for Research on Cancer (IARC) http://www.iarc.fr/

Environmental Effects:

Environmental fate information

Acrylamide is biodegradable and is not expected to persist in the environment. Acrylamide released into the air is expected to have a half-life of 6.6 hours and is likely to be removed by rain and fog. Acrylamide does not bind to soil and will move into soil rapidly, but it is degraded by microbes within a few days in soil and water

Aquatic and/or terrestrial toxicity:

There is little information about the toxicity of acrylamide to aquatic animals. In one species of fish it was of moderately toxic; it has little tendency to bioconcentrate.

The following websites provide additional information on the potential environmental effects of acrylamide:

- Agency for Toxic Substances and Disease Registry
  http://www.atsdr.cdc.gov/toxprofiles/tp203.html
- US EPA Office of Groundwater and Drinking Water
  http://www.epa.gov/safewater/contaminants/dw_contamfs/acrylami.html

Exposure:

The principal routes of acrylamide exposure for the general population are by drinking water, breathing of 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 and 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 or air and use of consumer products is very low in comparison to intake from food or from smoking.

Workers may breath vapors or come in skin contact with acrylamide during handling, storing, processing and polymerization of acrylamide and with trace amounts in handling, storing and processing of polyacrylamide.

Risk Management Recommendations:

Exposure to acrylamide in the workplace is covered by established exposure limits. The regulatory limit in the US is established by Occupational Safety and Health Administration (OSHA) and is 0.3 mg/m^3 as a time weighted average (TWA) over an 8 hour workday. The American Conference of Governmental Industrial Hygienists also recommends an occupational exposure limit of 0.3 mg/m^3.

Workplace exposure to acrylamide can be controlled by sufficient ventilation and proper handling and storage techniques. Examples include: ventilation system, proper protective equipment such as eye protection (i.e., splash proof goggles), normal work clothing which covers arms and legs, acrylamide resistant gloves, and NIOSH approved respirator in situations where exposure exceeds allowable exposure limits and/or ventilation alone is not sufficient.

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

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

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7. International Agency for Research on Cancer (IARC), Volume 60 (1994)
8. Agency for Toxic Substances and Disease Registry, Draft Toxicology Profile for Acrylamide (9/09) http://www.atsdr.cdc.gov/toxprofiles/tp203.html