Product Safety Assessment

AMPLIFY™ GR Functional Polymers

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Names

- AMPLIFY™ functional polymer
- AMPLIFY™ GR functional polymer

Product Overview

- AMPLIFY™ functional polymers are polyolefin plastics that have been engineered to meet specific end-use requirements or characteristics. They are manufactured by The Dow Chemical Company in four product groups:
  - AMPLIFY™ GR functional polymers are maleic anhydride grafted polyolefins.
  - AMPLIFY™ IO functional polymers are modified ethylene-acrylic acid ionomers.
  - AMPLIFY™ EA functional polymers are ethylene-ethyl acrylate (EEA) copolymers.
  - AMPLIFY™ TY functional polymers are maleic anhydride grafted polyolefins targeted for high performance applications.

This product safety assessment discusses AMPLIFY GR functional polymers. To learn more about AMPLIFY EA functional polymers, AMPLIFY IO functional polymers, or AMPLIFY™ TY functional polymers, visit Dow’s Product Safety Assessment Finder or the AMPLIFY Functional Polymers Products web page.

- AMPLIFY GR functional polymers are maleic anhydride grafted polyolefins. A polyolefin is a polymer from the ethylene family of hydrocarbons. Modification with maleic anhydride results in highly flexible and elastic polymers with excellent adhesion to nylon and ethylene vinyl alcohol (EVOH), metal, other polyolefins, cellulose, polyester, polycarbonate, and glass. AMPLIFY GR functional polymers are manufactured as white to off-white pellets or granules. For further details, see Product Description.

- AMPLIFY GR functional polymers are used as adhesives and tie layers; as well as in profile-extrusion, extrusion-coating, and powder-coating applications; and for wood-plastic, glass-filled, and other composite products. For further details, see Product Uses.

- AMPLIFY GR functional polymers are not sold for direct consumer use. However; because they are used in consumer products and packaging, consumers may come in contact with them. AMPLIFY GR polymers used in food and medical packaging applications comply with U.S. Food and Drug Administration (FDA) Code of Federal Regulations (CFR) Title 21, sections 175.105 or 177.1520(c). For further details, see Product Uses.

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manufacturing facility or at facilities using these polymers to manufacture other products. For further details, see [Exposure Potential].

- Eye contact with polymer solid or dust may cause irritation or corneal injury due to mechanical action (scratch the eyes). Elevated temperatures during thermal processing may generate vapor levels sufficient to cause eye or respiratory irritation. Skin contact is essentially nonirritating, and no adverse respiratory effects are anticipated from single exposure to polymer dust. The minor component maleic anhydride may cause an allergic respiratory response from processing fumes.\(^2\) For further details, see [Health Information].

- AMPLIFY™ GR functional polymers are expected to be inert in the environment. They are not expected to accumulate in the food chain and are not biodegradable. If introduced into water, these polymers will float. Ingestion by fish or wildlife may present a choking hazard.\(^2\) For further details, see [Environmental Information].

- AMPLIFY GR polymers are stable under recommended storage conditions. Exposure to temperatures well above recommended processing temperatures can cause these polymers to decompose.\(^2\) For further details, see [Physical Hazard Information].

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**Manufacture of Product**

- **Location** – Dow produces AMPLIFY™ GR functional polymers at facilities located in North America and Europe.

- **Process** – AMPLIFY GR functional polymers are produced by grafting small amounts of maleic anhydride onto polyolefin-based polymers.

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**Product Description**\(^2\)

AMPLIFY™ GR functional polymers are polyolefin plastics that have been engineered to meet specific end-use requirements or characteristics. They are sold for industrial use as white to off-white colored pellets or granules and typically have an acidic odor. AMPLIFY™ GR functional polymers are maleic-anhydride-grafted polyolefins. These polymers have maleic anhydride grafted onto (chemically bonded to) a polyethylene-based polymer to enhance polymer adhesion to metals and other materials. Residual or “unbonded” maleic anhydride levels within AMPLIFY GR functional polymers are equal to or less than 0.09%, complying with current guidelines.

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**Product Uses**\(^3,4\)

AMPLIFY™ functional polymers are used to manufacture plastic products and packaging. AMPLIFY™ GR functional polymers add high flexibility, elasticity, and toughness to other polymer resins. These polymers are in concentrate form. Applications include:

- **Adhesives and tie layers** – for pet-food, flexible-food packaging, etc.
- **Polymer modification** – for wood-plastic, glass-filled and many other composites
- **Profile extrusion** – for plastic pipe
- **Extrusion coating** – for coating steel pipes for corrosion prevention

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Exposure Potential

AMPLIFY™ GR functional polymers are not sold directly to consumers, but are present in products or packaging that consumers use. Based on the uses for these polymers, the public could be exposed through:

- **Workplace exposure** – Exposure can occur in manufacturing facilities or facilities that use these polymers to make other products. Avoid breathing process fumes. If exposure causes eye or respiratory discomfort, use a full-face respirator. Mechanical handling equipment can cause formation of dusts. Layers of combustible dusts should not be permitted to accumulate. To reduce the potential for dust explosions, maintain good housekeeping and electrically bond and ground equipment. Each facility should have a thorough training program for employees and appropriate work processes and safety equipment in place. See Health Information.

- **Consumer exposure to products containing AMPLIFY™ GR functional polymers** – AMPLIFY GR functional polymers used in food and medical packaging applications comply with U.S. Food and Drug Administration (FDA) Code of Federal Regulations (CFR) Title 21, sections 175.105 or 177.1520(c)6. In brief, these regulations state maleic anhydride modified polyolefins may be safely used as components of packaging adhesives or sealant layers in food contact applications when used according to prescribed conditions. See Health Information.

- **Environmental releases** – AMPLIFY polymers are non-volatile (do not evaporate), inert, solids. If released to soil or water, they will stay in soil or water. These polymers float and are not biodegradable. Spilled polymer may cause a slipping hazard. In the event of a spill, contain material if possible. Prevent material from entering soil, ditches, sewers, waterways, or ground water. Sweep up small spills and collect material in suitable and properly labeled containers. Use appropriate safety equipment. See Environmental, Health, and Physical Hazard Information.

- **Large releases** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be collected and reprocessed or disposed of properly. As a service to its customers, Dow can provide names of resources to help identify waste management, recycling, and reprocessing companies.

- **In case of fire** – Keep people away. Isolate the fire and deny unnecessary entry. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing, or fight fire from a safe distance. Use a water fog or fine water spray, dry chemical fire extinguishers, carbon dioxide fire extinguishers, or foam to fight fire. A direct water stream may spread the fire. Follow safety precautions. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

Health Information

**Eye Contact** – Eye contact with AMPLIFY™ GR polymer solid or dust may cause irritation or corneal injury due to mechanical action (scratch the eyes). Elevated temperatures during product processing may generate vapor levels sufficient to cause eye irritation, such as discomfort and redness.

**Skin Contact** – Skin contact with polymer pellets or granules is essentially nonirritating. Skin contact with heated polymer during processing operations may cause thermal burns. No adverse effects are anticipated from skin absorption.
Inhalation – Vapors or fumes released during thermal processing may cause respiratory irritation. The minor component maleic anhydride may cause an allergic respiratory response from processing fumes. AMPLIFY GR polymers contain equal to or less than 0.09% residual maleic anhydride.

Ingestion – These polymers have very low toxicity if swallowed. Harmful effects are not anticipated from swallowing small amounts; however, swallowing may cause choking or gastrointestinal blockage.

AMPLIFY™ GR polymers are safe for food and beverage applications and comply with one or more of the following U.S. Food and Drug Administration (FDA) regulations:
- Regulation 21 CFR 175.105
- Regulation 21 CFR 177.1520(c)(6)

For specific FDA regulatory status information, consult the relevant Technical Information Sheet. For more information, see the relevant Safety Data Sheet and Regulatory Data Sheet.

Environmental Information
AMPLIFY™ GR functional polymers are non-volatile, inert plastics. If introduced into soil, they are expected to remain in soil. They will float in water. These materials will not bind to soil or sediment. AMPLIFY polymers are not biodegradable. Although polymers are considered essentially nonbiodegradable, they are likely to degrade slowly in the environment by a combination of physical, chemical, and biological processes. Surface degradation can occur upon exposure to sunlight.

AMPLIFY GR polymers are not likely to accumulate in the food chain due to their high molecular weight. Although these materials are non-toxic, in pellet or bead form they may mechanically cause adverse effects if ingested by waterfowl or aquatic life (choking hazard).

For more information, see the relevant Safety Data Sheet.

Physical Hazard Information
AMPLIFY™ GR functional polymers are stable under recommended storage conditions. Exposure to temperatures well above normal processing temperatures can cause these polymers to decompose. Processing may release irritating fumes and other decomposition products, such as aldehydes, alcohols, organic acids, and trace amounts of hydrocarbons. At temperatures exceeding the melt temperature, polymer fragments can be released.

Spilled polymer pellets are a slipping hazard.

For more information, see the relevant Safety Data Sheet.

Regulatory Information
Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of AMPLIFY™ GR functional polymers. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Technical Information Sheet, or Contact Us.

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Additional Information

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/amplify/contact/contact.htm)
- AMPLIFY™ Functional Polymers website: (http://www.dow.com/amplify/index.htm)
- AMPLIFY GR Functional Polymers: Make the Most of a Sticky Situation, The Dow Chemical Company, Form No. 273-02401 (http://www.dow.com/products/)
- U.S. Food and Drug Administration (FDA), Department of Health and Human Services website, Code of Federal Regulations Title 21 webpage, (search 175.105 or 177.1520) (http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCFR/CFRSearch.cfm)


References

2 AMPLIFY GR 204 Functional Polymer Material Safety Data Sheet, The Dow Chemical Company
3 AMPLIFY GR Functional Polymers: Make the Most of a Sticky Situation, The Dow Chemical Company, Form No. 273-02401-0907 SMG
NOTICES:

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