PARALOID™ EXL-2311/2313/2315 IMPACT MODIFIERs
Core Shell Acrylic Copolymer for Engineering Resin Applications

Regional Availability
Asia Pacific

Description
Dow Plastics Additives is a well-known supplier of specialty additives used to improve the characteristics of a variety of engineering resin systems, including polycarbonate, polyesters, polyamides, polyacetal, and polymer blends.

PARALOID™ EXL-2311/2313/2315 IMPACT MODIFIERs are acrylic copolymers with a core/shell structure. Their unique structure offers good compatibility with polycarbonates, polyesters, polyamides and their alloys, providing excellent toughness without sacrificing rigidity. The chemical composition based on acrylate derivations and the specially designed formulation gives them excellent weather-resistant and heat-resistant properties.

<table>
<thead>
<tr>
<th>Grade</th>
<th>In Air (ºC)</th>
<th>In Nitrogen (ºC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temperature @ 1% weight loss point</td>
<td>Temperature @ on set point</td>
</tr>
<tr>
<td>PARALOID™ EXL-2311</td>
<td>285</td>
<td>280</td>
</tr>
<tr>
<td>PARALOID™ EXL-2313</td>
<td>281</td>
<td>277</td>
</tr>
<tr>
<td>PARALOID™ EXL-2315</td>
<td>289</td>
<td>304</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Particle Size</th>
<th>PARALOID™ EXL-2311</th>
<th>PARALOID™ EXL-2313</th>
<th>PARALOID™ EXL-2315</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>Big</td>
<td>Small</td>
<td></td>
</tr>
</tbody>
</table>
Performance in Polycarbonate

PARALOID™ EXL-2311/2313/2315 IMPACT MODIFIERs offer excellent impact performance in polycarbonates, which helps polycarbonates to overcome brittleness and notch sensitivity in thick sections.

Adding acrylate impact modifiers can reduce the ductile-brittle transition temperature of polycarbonates. As the graph below shows, PARALOID™ EXL-2315 IMPACT MODIFIER has better impact performance at -40°C with 5% loading level than other acrylate impact modifiers.
PARALOID™ EXL-2311/2313/2315 IMPACT MODIFIERs have very good stability against heat and humidity. They are very stable in an oven heating test. PARALOID™ EXL-2311 especially has better performance in a hydrolysis test.

The picture of polycarbonate compound after an oven heating test (aging temperature is 130°C, 5% impact modifiers in PC).

![Melt Flow Index after Hydrolysis Aging of PC Compound](chart)

**Matrix:** Mid Viscosity Polycarbonate

**Acrylate IM loading:** 5%

**Hydrolysis:** 90°C, 95% RH

**MFI Test:** 300°C, 1.2kg,
Performance in Polybutylene Terephthalate

PARALOID™ EXL-2311/2313/2315 IMPACT MODIFIERs are suitable to modify polybutylene terephthalate (PBT). They can improve the impact strength, break elongation, and release mold-in stress. PARALOID™ EXL-2311 IMPACT MODIFIER has better flow ability in PBT and PARALOID™ EXL-2315 IMPACT MODIFIER shows better efficiency, especially at high dosage such as 25%, than other acrylate impact modifiers.

Acrylate Impact Modifiers Performance in PBT
PARALOID™ EXL-2311/2313/2315 IMPACT MODIFIERS also work in glass fiber reinforced PBT to release stress and improve the impact strength and elongation.

**Processing Information**

PARALOID™ EXL-2311/2313/2315 IMPACT MODIFIERS are easy-flow powder form, which can be handled easily. A twin screw extruder can disperse them into the plastics matrix.
Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

Handling Precautions

Before using this product, consult the Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat, resulting in a possible combustion hazard, particularly when plastic tanks are used.

Avoid high concentrations of dust in air and accumulation of dust on equipment. An airborne dust of this material can create a dust explosion. When handling and processing this material, local exhaust ventilation may be required to control dust and reduce exposure to vapors. To prevent dust explosions, employ bonding and grounding for operations capable of generating static electricity. Dispose by placing powder or pellets in airtight bags.

Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations.

Contact your Dow Plastics Additives Technical Representative for more information.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products—from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Medical Applications Policy

NOTICE REGARDING MEDICAL APPLICATION RESTRICTIONS: Dow will not knowingly sell or sample any product or service (“Product”) into any commercial or developmental application that is intended for:

- long-term or permanent contact with internal body fluids or tissues. “Long-term” is contact which exceeds 72 continuous hours;
- use in cardiac prosthetic devices regardless of the length of time involved ("cardiac prosthetic devices" include, but are not limited to, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems, and ventricular bypass-assisted devices);
- use as a critical component in medical devices that support or sustain human life; or
- use specifically by pregnant women or in applications designed specifically to promote or interfere with human reproduction.

Dow requests that customers considering use of Dow products in medical applications notify Dow so that appropriate assessments may be conducted. Dow does not endorse or
claim suitability of its products for specific medical applications. It is the responsibility of the medical device or pharmaceutical manufacturer to determine that the Dow product is safe, lawful, and technically suitable for the intended use. DOW MAKES NO WARRANTIES, EXPRESS OR IMPLIED, CONCERNING THE SUITABILITY OF ANY DOW PRODUCT FOR USE IN MEDICAL APPLICATIONS.
Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including Safety Data Sheets, should be consulted prior to use of Dow products. Current Safety Data Sheets are available from Dow.

Regulatory Information

If your application includes a sensitive application such as food contact or drinking water requirements or if you need other regulatory information, please contact your local Dow representative.

Contact:
North America: 1-800-447-4369
Latin America: (+55)-11-5189-9000
Europe: (+800)-3-694-6367
(Toll) +31-11567-2626
Asia-Pacific: (+800)-7776-7776
(Toll) +60-3-7965-5392
http://www.dow.com

NOTICE: No freedom from infringement of any patent owned by Dow or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. The product shown in this literature may not be available for sale and/or available in all geographies where Dow is represented. The claims made may not have been approved for use in all countries. Dow assumes no obligation or liability for the information in this document. References to “Dow” or the “Company” mean the Dow legal entity selling the products to Customer unless otherwise expressly noted. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.