PARALOID™ BPM-515 Acrylic Impact Modifier for Polyactic Acid Resin

Description

PARALOID BPM-515 Acrylic Impact Modifier is specially designed to improve the impact resistance of Polylactic Acid (PLA) compounds while maintaining clarity for packaging applications.

Thanks to the distinct morphology and composition of the modifier, blending PARALOID BPM-515 Acrylic Impact Modifier with PLA improves impact properties without sacrificing the transparency of the product. In addition to better impact properties, PLA modified with BPM-515 shows a marked reduction in brittle behavior during cutting and hole punching operations. All of this is accomplished at a lower loading level of the acrylic modifier thus making PARALOID BPM-515 Acrylic Impact Modifier a more sustainable and lower use cost solution.

For over 30 years, acrylic impact modifiers from The Dow Chemical Company have led to the development and market recognition of many distinct resins and brought The Dow Chemical Company a wealth of scientific and industrial experience.

Acrylic impact modifiers similar to PARALOID™ BPM-515 Acrylic Impact Modifier used at up to 5% loading levels have been found not to adversely effect the biodegradability of PLA as measured by ASTM D6400-04 per ASTM D5338.

Applications/uses

PARALOID BPM-515 Acrylic Impact Modifier is especially useful in applications where a balance between toughness and transparency is a key. These include thermoformed packaging applications, as well as industrial and consumer goods.

Impact performance

PARALOID BPM-515 Acrylic Impact Modifier offers all the performance benefits of PARALOID BPM-500 at a lower use cost. PARALOID™ BPM-515 Acrylic Impact Modifier provides excellent impact properties at use levels as low as 1% although use levels from 2–3% are recommended.

Figure 1. Gardner Impact Performance for PLA modified with PARALOID™ BPM-515 Acrylic Impact Modifier

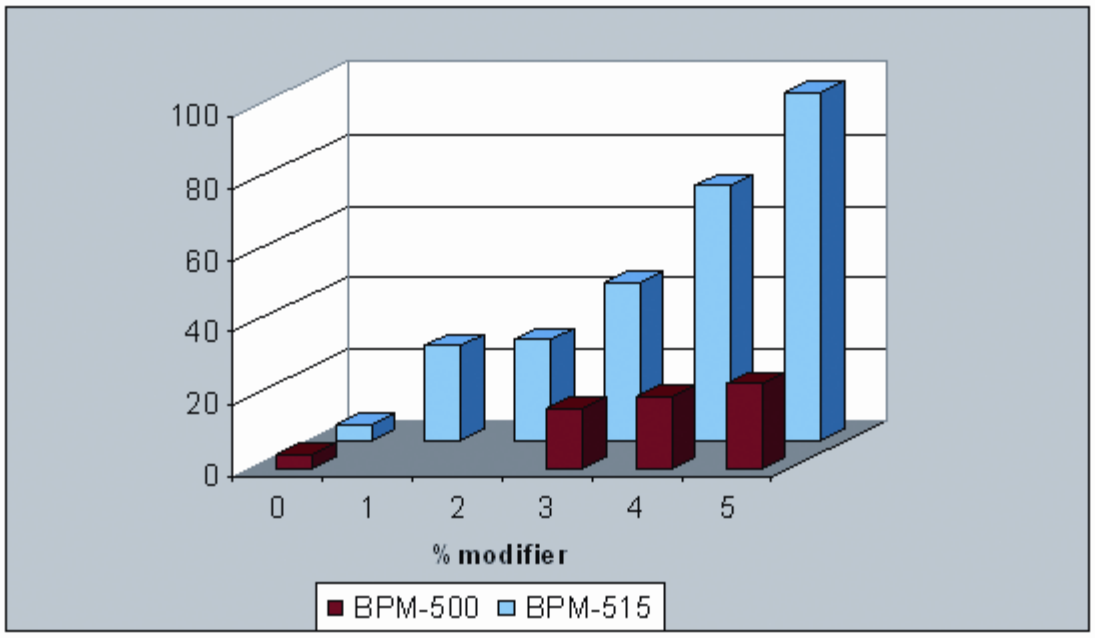
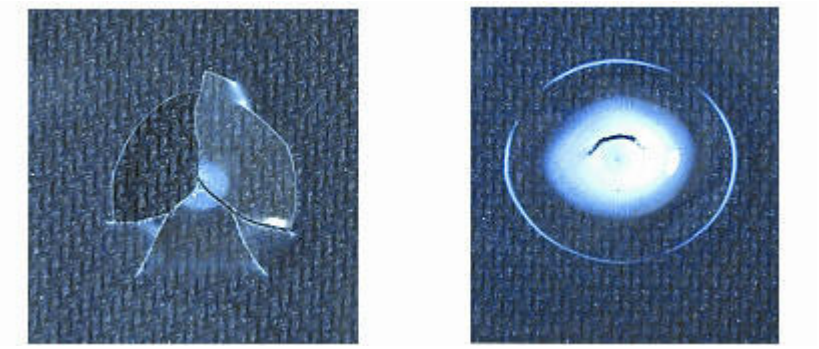


Figure 2. Brittle to Ductile transition of PLA using PARALOID BPM-515 Acrylic Impact Modifier



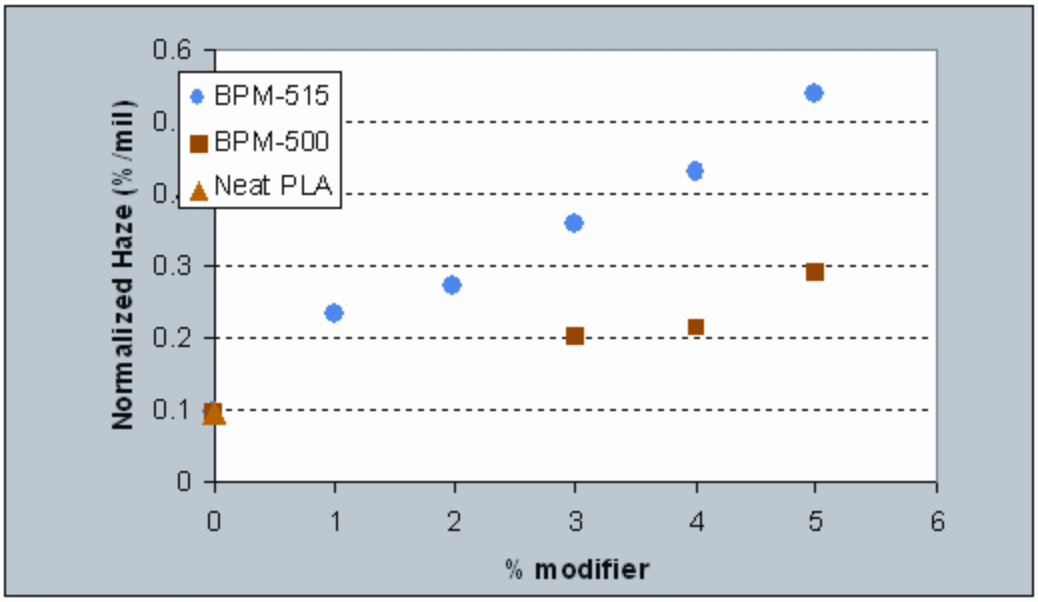
Tear resistance

PARALOID BPM 500 enhances the tear resistance and the cutability of PLA extruded sheets. The brittle nature of pure PLA could lead to uneven rough edges of the sheet during cutting and handling. The addition of PARALOID BPM-515 Acrylic Impact Modifier results in clean cuts and resistance to unwanted cracking during processing.

Optical Properties

Thanks to the combination of the nano-scale particle size and excellent dispersability of PARALOID™ BPM-515 in PLA, the addition of the modifier has minimal effect on the clarity of the PLA film. The higher efficiency of PARALOID BPM-515 Acrylic Impact Modifier compared to PARALOID BPM-500 translates to improved impact at a comparable haze level at lower addition levels. The haze measured on a 15 mil extruded sheet is less than 6% for up to 3 wt% of PARALOID BPM-515 Acrylic Impact Modifier loading.

Figure 3. Normalized Haze Comparison between PARALOID™ BPM-515 Acrylic Impact Modifier and PARALOID BPM-500 for PLA



Physical description

Appearance: Free flowing white powder
Bulk Density: 0.48-0.56 g/cm^3
Total residual volatiles: <1%

Processing Information

PARALOID BPM-515 Acrylic Impact Modifier is supplied in a free flowing powder form. It is easily dispersed into PLA by controlled addition of the additive during melt mixing in a twin screw extruder. A typical heating profile for the twin screw extruder is shown in the table below.

Table 2. Recommended twin-screw extruder temperature profile

Zone	1	2	3	4	5	6	7	8
T°C	150	180	190	200	200	200	200	200

For processing with PLA on a single screw extruder or other processing equipment, it is recommended to blend pre-compounded PARALOID BPM-515 Acrylic Impact Modifier in PLA.

The addition of PARALOID™ BPM-515 Acrylic Impact Modifier at the recommended use levels under typical processing conditions does not affect the thermal stability of PLA.

It is recommended that both the PARALOID BPM-515 Acrylic Impact Modifier and PLA resin be thoroughly dried to below 250 ppm moisture before compounding.

Regulatory Compliance

PARALOID BPM-515 Acrylic Impact Modifier complies with EU Directive 2002/72/EC of 6 August 2002 which governs food packaging in the European Union. In compliance with US Food and Drug Administration (FDA) requirements, PARALOID BPM-515 Acrylic Impact Modifier may be used up to 5% in food contact resins (maximum thickness 50 mil) for aqueous, acidic and low alcohol foods under conditions of use B-H in compliance with the Federal Food and Drug, and Cosmetic Act.

We moreover recommend that you verify on a regular basis with The Dow Chemical Company, for the latest food status update of our product.

Handling Precautions

Before using this product, consult the Material Safety Data Sheet (MSDS)/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.

Storage

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

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 The Dow Chemical Company 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.

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.

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