Dow Packaging & Specialty Plastics

Product Data Sheet

BYNEL™ E418

Adhesive Resin

General Information

Product Description	BYNEL™ Series 3800 resins are anhydride-modified ethylene vinyl acetate polymers. They are available in pellet form for use in conventional extrusion and coextrusion equipment designed to process polyethylene (PE) resins.

Status

Material Status	Commercial: Active

Typical Characteristics

Composition	Medium% By Weight Maleic Anhydride Graft levels are defined as: Low < 0.2%; Medium 0.2-0.5%; High 0.5-1.0%; Ultra high > 1.0%
Features	Contains an amide based slip agent.
Characteristics / Benefits	Physical properties of BYNEL™ Series 3800 resins are typical of EVA resins with similar density and melt index values.

Typical Properties

Physical	Nominal Values	Test Method(s)	
*Density ( )	0.95 g/cm³	ASTM D792	ISO 1183
*Melt Flow Index (190°C/2.16kg)	12 g/10 min	ASTM D1238	ISO 1133

Thermal	Nominal Values	Test Method(s)	
*Melting Point (DSC)	74 °C (165.2 °F)	ASTM D3418	ISO 3146
Freezing Point (DSC)	48 °C (118.4 °F)	ASTM D3418	ISO 3146
Vicat Softening Point ( )	42 °C (107.6 °F)	ASTM D1525	ISO 306

Adhesive Evaluation	The performance of any adhesive resin should be evaluated within the context of the application. The adhesive is designed to bond materials that would not ordinarily adhere to each other. In most cases, peel strength is used as a measure of performance. Although this is a convenient test, peel strength is affected not only by adhesion, but also by peel angle, separation rate, temperature, and tensile and modulus properties of the materials, and often by the time elapsed since the formation of the bond. Post-treatment of the multi-layer structure, such as heat sealing, thermoforming or orientation can also affect peel strength. If peel strength is used as a measure of adhesive performance, it is imperative that peel strength be evaluated not only at the time of manufacture, but throughout the life of the product and under all the various conditions to which the structure will be exposed. Only then can the performance of the adhesive be related to peel strength.

Processing Information

*Maximum Processing Temperature	235 °C (455 °F)
General Processing Information	The temperature profiles shown below are for initial evaluations of BYNEL™ adhesive resins in the 3800 series. This profile is designed to provide adequate exposure time of the adhesive resin to elevated temperatures. Exposure to elevated temperatures activates the anhydride which improves the bonding capability of the adhesive resin. Regardless of the profile used, the adhesive resin should be exposed to temperatures above 210C (410F) for several minutes prior to contact with the other molten resins in coextrusion in order to ensure adequate performance of the adhesive resin.

Because the BYNEL™ 3800 series resins have low softening points, it is a good idea to run the rear of the extruder as cool as possible, then build quickly to the melt temperature. Water cooling of the screw and/or hopper feed throat may help avoid bridging problems.

We suggest that the maximum melt temperature be limited to 235C (455F) to guard against overheating the EVA. If adhesion results are adequate, we suggest evaluating even lower melt temperatures such as 230C (446F).

Variation of these suggested temperature profiles may be appropriate depending upon the screw configuration, potential extruder horsepower limitations, potential back pressure limitations, the need to match rheologies and/or the stability of the other resins in the coextrusion. Film quality will also depend upon the residence time of the adhesive resin in the system. Dead spots may result in localized overheating and should be avoided by ensuring the flow path for the adhesive is as streamlined as possible.

We suggest using a standard polyolefin screw when extruding BYNEL™ 3800 series resins. Excessively deep flights should be avoided as they might result in poor melting of the adhesive resin. Excessively high shear screws should also be avoided to minimize gel and degradation formation. It is also important to properly size the extruder for the output desired. Running large extruders at very low RPMs should be avoided.

For producing monolayer adhesive films with BYNEL™ 3800 adhesive resins, extrusion conditions commonly used for converting ethylene vinyl acetate resins with high levels of vinyl acetate into films can be employed.

When extruding BYNEL™ 3800 series resins as an exposed outer surface in a multi-layer coextrusion, problems related to the tackiness and high coefficient of friction of these products may be evident. In this case, it is suggested that the extrusion temperature be lowered to 160C - 185C (320C - 365F) or less. Addition of slip and silica-based antiblock packages may also be appropriate to prevent blocking and improve film handling, although these additive packages may modify the resin's bonding characteristics.

If the coextrusion process is stopped for short periods of time, the screw in the adhesive extruder should be kept turning at a low RPM level. For a permanent shutdown, the BYNEL™ adhesion resin should be purged out using an available polyethylene resin run at the same extrusion temperature used during the extrusion process of the adhesive resin. Making frequent changes in screw speed during the shutdown process and subsequent start-up will help remove the previous material from the system more effectively. Sometimes upon start-up of the adhesive resin, excessive amounts of gel may be observed. This may be due to the natural ability of the adhesive resin to act as a purging compound. In this case, continued extrusion will eventually clear up the problem.

CoExtrusion w/ EVOH	Nominal Values
Processing Information	Proposed Extruder Set Temperatures
Feed Zone	135 °C (275 °F)
Second Zone	185 °C (365 °F)
Third Zone	235 °C (455 °F)
Fourth Zone	235 °C (455 °F)
Fifth Zone	235 °C (455 °F)
Adapter Zone	235 °C (455 °F)
Die Zone	235 °C (455 °F)

FDA Status Information	BYNEL™ E418 Adhesive Resin complies with Food and Drug Administration Regulation 21 CFR 175.105 - - Adhesives. This Regulation describes adhesives that may be used as components of articles intended for use in packaging, transporting, or holding food, subject to the limitations and requirements therein.

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