Technical Information

# BYNEL™ 50E803

## Adhesive Resin

### Description

**Product Description**

BYNEL™ Series 5000 resins are anhydride-modified polypropylene resins. They are available in pellet form for use in conventional extrusion and coextrusion equipment designed to process polypropylene (PP) resins.

BYNEL™ 50E803 is a grade with a higher level of anhydride modification, and is mainly intended for use as a component in a blend with other polyolefin resins. It is not intended for extrusion in its pure form in typical extrusions or coextrusions.

### Restrictions

**Material Status**

Commercial: Active

### Typical Characteristics

**Characteristics / Benefits**

Physical properties of BYNEL™ Series 5000 resins are typical of polypropylene resins with similar density and melt flow rates.

**Applications**

BYNEL™ 5000 series resins adhere to a variety of materials. They are most often used to adhere to PP, EVOH and polyamide. These resins are designed for applications in which EVOH or polyamide is melt coextruded with PP or PP copolymers. BYNEL™ 50E803 is intended mainly for blending into PP to provide PP the ability to bond to barrier resins such as polyamide or EVOH.

### Typical Properties

| Physical | Nominal Values | Test Method(s) | |
|---|---|---|---|
| *Density ( ) | 0.90 g/cm³ | ASTM D792 | ISO 1183 |
| *Melt Flow Rate ( measured at conditions of 160°C / 325 grams ) | 22 g/10 min | ASTM D1238 | ISO 1133 |
| Melt Flow Rate (calculated to conditions of 190°C / 2.16 kg) | 470 g/10min | ASTM D1238 | ISO 1133 |

| Thermal | Nominal Values | Test Method(s) | |
|---|---|---|---|
| *Melting Point ( DSC ) | 132 °C ( 269.6 °F ) | ASTM D3418 | ISO 3146 |
| Freezing Point ( DSC ) | 93 °C ( 199.4 °F ) | ASTM D3418 | ISO 3146 |
| Vicat Softening Point ( ) | 112 °C ( 233.6 °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**

260 °C ( 500 °F )

**General Processing Information**

The temperature profiles shown below are for initial evaluations of BYNEL™ 50E803 adhesive resin when blended with PP. These profiles are 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.

In coextrusions with thermally sensitive resins such as EVOH or EVA, we suggest that the maximum melt temperature be limited to 235C (455F) to guard against overheating the EVOH or EVA. If adhesion results are adequate, we suggest evaluating even lower melt temperatures such as 210 - 220C (410 - 428F).

For coextrusion with polyamides or other thermally stable resins, the melt temperature can be higher. We suggest a maximum melt temperature of 260C (500F). This should provide acceptable bond strengths and film quality under almost all coextrusion conditions. If adhesion results are adequate, melt temperatures can be lowered. While it is possible to extrude BYNEL™ 5000 series resins as high as 300C (572F), such high extrusion temperatures, particularly when coupled with long residence times, may result in some film imperfections. In certain streamlined extrusion operations, where residence times are short, it may be possible to use temperatures higher than 260C (500F).

Variation of these suggested temperature profiles may be appropriate depending upon the screw configuration, potential extruder horsepower limitations, potential backpressure limitations, the need to match rheology 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 any standard polyolefin working screw when extruding BYNEL™ 5000 series resins. Excessively deep flights should be avoided as they might result in poor melting of the adhesive resin. 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™ 5000 adhesive resins, extrusion conditions commonly used for converting polypropylene into films can be employed.

While blending BYNEL™ 50E803 into PP can impart bonding capability to PA and EVOH, performance is a complex issue which will depend upon, in part, the amount of BYNEL™ 50E803 added to PP, the type of PP used and the type of extrusion process. We suggest you consult your Dow representative prior to initiating blending trials.

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 or polypropylene 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 Processing | Nominal Values |
|---|---|
| Processing Information | Proposed Extruder Set Temperatures |
| Feed Zone | 160 °C ( 320 °F ) |
| Second Zone | 210 °C ( 410 °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 ) |

| CoExtrusion w/Nylon Processing | Nominal Values |
|---|---|
| Processing Information | Proposed Extruder Set Temperatures |
| Feed Zone | 160 °C ( 320 °F ) |
| Second Zone | 235 °C ( 455 °F ) |
| Third Zone | 260 °C ( 500 °F ) |
| Fourth Zone | 260 °C ( 500 °F ) |
| Fifth Zone | 260 °C ( 500 °F ) |

| | |
|---|---|
| **Adapter Zone** | **260 °C ( 500 °F )** |
| **Die Zone** | **260 °C ( 500 °F )** |
| **FDA Status Information** | **BYNEL™ 50E803 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.**<br><br>**The information and certifications provided herein are based on data we believe to be reliable, to the best of our knowledge. The information and certifications apply only to the specific material designated herein as sold by Dow and do not apply to use in any process or in combination with any other material. They are provided at the request of and without charge to our customers. Accordingly, Dow cannot guarantee or warrant such certifications or information and assumes no liability for their use.** |
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