

VINNEX® RESINS FOR HEAT-RESISTANT BIOPOLYESTER FILMS AND SHEETS

Improved Processing and Performance of Heat-Resistant Polybutylene-Succinate-Based Films and Sheets

Poly(lactic acid) (PLA) is currently the most important biopolyester for producing biobased/biodegradable plastic materials. However, the poor heat resistance of amorphous PLA makes the material unsuitable for a wide range of applications. The biopolyester polybutylene succinate (PBS) has a much higher heat resistance and is readily biodegradable, but its poor processing properties currently prevent its widespread use.

With VINNEX® resins, WACKER offers modifiers and processing aids for PBS. All the advantages of PBS can be retained. Blends of PBS with VINNEX® resins display improved melt strength, enabling blown and cast film extrusion, as well as paper extrusion coating.

Improved Processing

Standard PBS has a low melt strength, which makes processing, especially blown film extrusion, difficult. VINNEX®, a binder system based on polyvinyl acetate, can act as a processing aid. The addition of 5–20% VINNEX® resins significantly improves the melt strength. PBS/VINNEX® blends can be easily processed on traditional extrusion and thermoforming equipment, enabling blown film, cast film and sheet extrusion.

Improved Performance

The addition of VINNEX® improves elongation rates and tensile strength, making PBS suitable for a wider range of applications. PBS/VINNEX® films are very flexible and highly heat resistant, and their haptic properties are similar to those of conventional LDPE films.

Long-Term Stability

VINNEX® resins significantly reduce the post-crystallization tendencies of PBS and therefore keep the initial properties constant. No changes in the thermal or mechanical properties of PBS blends containing VINNEX® were observed within 12 weeks.

Miscibility with PLA and Cost-Effectiveness of Blends

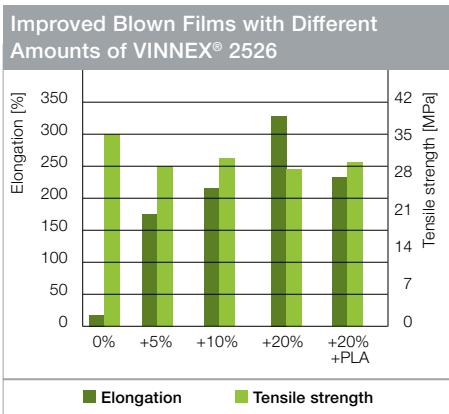
As the cost of PBS is still higher than that of the standard biopolyester PLA, blending the two together can improve the cost position of the final blend. However, the miscibility of PBS and PLA is very limited. VINNEX® acts as a compatibilizer and eliminates the miscibility gap. The addition of 5–20% VINNEX® resins allows the two biopolyesters to be blended homogeneously in any mixing ratio. This enables the customization of properties to suit the desired application and improves the cost-effectiveness of the blend.

Properties of Recommended VINNEX® Resins

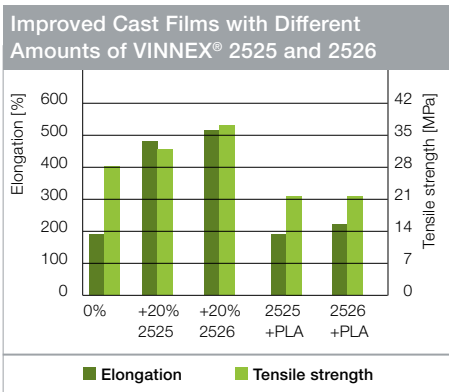
	VINNEX® 2525	VINNEX® 2526
Composition	Vinyl acetate	Vinyl acetate
Properties	Rigid	Rigid
T _g [°C]	44	44.5
Density [kg/m ³]	1,180	1,180
Bulk density [kg/m ³]	700–850	700–850
MFR melt index ¹ [ccm/10 min]	15.4	5.4
Food contact ²	Yes	Yes
Recommended use level [%]	10–20	5–20

¹ MFR melt index measured at 150 °C / 21.6 kg / 2 mm

² Suitable for food contact according to EU regulations for Food Contact and FDA (US Food and Drug Administration, §175.105, §175.300, §176.170 and §176.180)



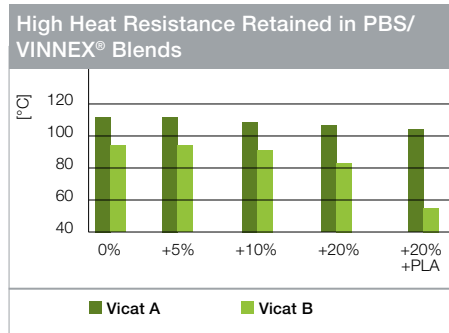
Increasing amounts of VINNEX® 2526 added to PBS (GS Pla FZ 91 PD, Mitsubishi Chemicals). Last column: 30% of PBS replaced by PLA (Ingeo 4043D, Nature Works LLC).



20% of VINNEX® 2525 or 2526 added to PBS (GS Pla FZ 91 PD, Mitsubishi Chemicals). Last two columns: additionally 30% of PBS replaced by PLA (Ingeo 4043D, Nature Works LLC).

Paper Extrusion Coating

The improved melt strength of PBS/ VINNEX® blends opens up new applications for PBS. By significantly reducing necking during cast extrusion, the material can be used for paper extrusion coating. High heat resistance and good biodegradability are particularly desirable in this application, e.g. for paper cups.



Increasing amounts of VINNEX® 2526 added to PBS (GS Pla FZ 91 PD, Mitsubishi Chemicals). Last column: 30% of PBS replaced by PLA (Ingeo 4043D, Nature Works LLC).

Retention of Biopolyester Biodegradability

Various blends of biopolyesters with VINNEX® have already passed the industrial composting test (ISO 14855 and EN 13432). As for every bioplastic compound, biodegradation is largely

dependent on the respective formulation and has to be determined case by case. For more detailed information, please contact your technical service representative.

VINNEX® in Food Contact Applications

VINNEX® 2525 and VINNEX® 2526 can be used in food contact applications in accordance with EU regulations on food contact and the US Food and Drug Administration (FDA, §175.105, §175.300, §176.170 and §176.180).

At a Glance: Advantages of PBS/VINNEX® Blends

- VINNEX® improves the melt strength of PBS, enabling blown and cast film extrusion, as well as paper extrusion coating
- VINNEX® improves the elongation properties and tensile strength of PBS, opening up various packaging applications
- Thermal and mechanical properties can be kept constant over time by reducing the post-crystallization tendencies of PBS
- VINNEX® resins eliminate the miscibility gap between PBS and PLA, making it possible to blend the two biopolyesters in any mixing ratio
- PBS biodegradability can be retained
- Both VINNEX® 2525 and 2526 can be used in food contact applications (EU and FDA)



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