



Global Marketing Biopolymers

Product Information

Version 1.0

January 2014

G-PM/PB

# ecovio<sup>®</sup> PS1606

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## Product description

ecovio<sup>®</sup> PS1606 (old name: ecovio<sup>®</sup> FS Paper C1500) is our compostable product for paper coating based on renewable resources. It is essentially a special grade of our new compostable copolyester ecoflex<sup>®</sup> FS and polylactic acid (PLA). ecovio<sup>®</sup> PS1606 contains 75 % of renewable resources according to ASTM D 6866.

In the structure of ecovio<sup>®</sup> PS1606 our ecoflex<sup>®</sup> FS transfers its beneficial properties – high toughness and draw down, excellent welding and good adhesion to cellulose – into the new product for extrusion coating of paper and board.

## Applications

Typical applications of ecovio® PS1606 are paper wraps e. g. for fresh food (cheese, meat, fish) or snack food, portion sachets for sugar and salt; lawn and leaf bags as well as coated card board e. g. for coffee cups, plates; tubs for fats and spreads and freezer boxes.

Because of its unique combination of sealing and barrier properties against mineral oil, fat and hydrocarbons ecovio® PS1606 can also be used in co-extrusion with other biodegradable polymers to enhance the barrier properties of a multilayer with paper and board.

In view of numerous factors influencing functionality and shelf life of ecovio® films and coatings and finished articles made thereof the production parameters have to be tested by converters before utilization. Additionally sufficient field tests are required to ensure the right functionality of the articles made from ecovio® PS1606.

## General Properties of Coatings using ecovio® PS1606

- Good scratch resistance
- Barrier for fat, liquids, aromas and mineral oils
- Relatively high water vapor transmission rate
- Weld strength comparable to LDPE at temperatures 20 to 30 °C (36 to 54 °F) below LDPE level
- Good printability using alcohol and/or water based colors

## Special Barrier Properties

Using an accelerated migration test of mineral oil at 60 °C (140 °F) for paper samples extrusion coated with ecovio® PS1606 the following result has been obtained by Kantonales Labor, CH-Zürich (Table 1):

- Mineral oil migration lag time measured in days at 60 °C using Gravex 913 (75 % MOSH\*, 25 % MOAH\*\*)
- Lag time at 60 °C recalculated in time unit at 22 °C

| Substrate                                | ecovio® PS1606                | Break Through @ 22 °C |
|--|-------------------------------|-----------------------|
| Fresh Fiber Board, 210 g/m <sup>2</sup>  | 16 g/m <sup>2</sup> (12.8 µm) | > 9 years             |
| Glassine Paper, 92 g/m <sup>2</sup>      | 16 g/m <sup>2</sup> (12.8 µm) | > 9 years             |
| Recycled Board, 290 g/m <sup>2</sup>     | 29 g/m <sup>2</sup> (23.2 µm) | > 6.8 years           |
| LDPE-Film, 100 µm (92 g/m <sup>2</sup> ) | –                             | > 10 h                |

Source: BASF SE, Ludwigshafen based on results of Grob, K. Kantonales Labor Zürich, April 2011

ecovio® PS1606 provides a special combination of **sealing**, mechanical and barrier properties. ecovio® PS1606 has an excellent barrier against migration of mineral oil and hydrocarbons e. g. ethylene and various other chemicals from packaging cartons made of recycled paper and board. Detailed information is available upon request.

\* MOSH = Mineral Oil Saturated Hydrocarbons

\*\* MOAH = Mineral Oil Aromatic Hydrocarbons

## Food Regulatory Status

ecovio® PS1606 is one of the few biodegradable plastics, which complies in its composition with the European food stuff legislation for food contact to a variety of food. A migration test has been passed at 40 °C (104 °F) for 10 days concerning the food simulants 3 % acetic acid, 10 % ethanol and olive oil.

- Food Contact Notifications can be quoted for food contact of < 80 µm of ecovio® PS1606 in USA under conditions B (Boiling water sterilized 212 °F (100 °C)) to H (Frozen or refrigerated storage: Ready-prepared foods intended to be reheated in container at time of use etc.).
- Good test results according to European legislation have been obtained for short term high temperature food contact of 500 µm ecovio® PS1606 at 150 °C (302 °F), 30 min. into Tenax and 100 °C (212 °F), 30 min. into water supporting the application of the coating in fast food applications.

The converter or packer is responsible for the suitability of the article for the application. A food contact statement for ecovio® PS1606 is available by BASF SE or BASF Corporation upon request.

## Certification of Compostability and Biodegradability

ecovio® PS1606 can be degraded by micro-organisms under industrial composting conditions. The biodegradation process depends on the specific environment (e.g. climate, substrate, population of micro-organisms). The registration according to the American standard ASTM D 6400 and the European standard DIN EN 13432 for compostable and biodegradable polymers has been performed up to a maximum thickness of **624 µm**. Documents are available upon request. Thus paper articles coated with ecovio® PS1606 can be certified for composting.

Experiments using paper coated with ecovio® PS1606 in thermophilic biogas plants with compost post treatment facility have demonstrated the compatibility to this treatment of municipal biowaste.

## Recycling of Paper and Board Coated with ecovio® PS1606

Coatings from ecovio® PS1606 are as repulpable as LDPE coatings in a paper recycling process (pilot plant result, PTS, Germany).

## Drying Conditions

Because of the moisture sensitivity of the PLA component of ecovio® PS1606 at melt temperatures in the order of > 230 °C (446 °F) we have to assure a maximum moisture content of below 600 ppm, better below 250 ppm prior to production. In most cases the high extruder output rate will allow the use of material directly from the big bag without drying. If necessary – e.g. after storage of an opened big bag – drying of ecovio® PS1606 in desiccated air dryers with a dew point of -40 °C (-40 °F) at maximum 60 °C (140 °F) for a minimum of 4 hours or overnight drying at 50 °C (122 °F) is recommended.

## Purging out of LDPE and Start-up of Production

Extrusion coating with ecovio® PS1606 starts with purging of LDPE in the extruder. The purging procedure is very important for the melt stability of ecovio® PS1606 during production. Detailed information on processing is available upon request.

## Extrusion Coating Process

In general we can summarize our results of extrusion coating trials as follows:

- Excellent processing on conventional extrusion coating lines designed for biodegradable polyesters
- Processing feasible in most cases on extrusion coating lines for LDPE depending on machine design
- Constant extruder output rate determines achievable line speed. Thus best results using a melt pump
- A typical coating thickness of LDPE can be achieved in most cases. Due to higher density (1.25 g/cm<sup>3</sup> instead of 0.92 g/cm<sup>3</sup>) a higher coating weight is needed.
- Minimum coating weights depending on application requirements and equipment. In general coating weights of 12 to 30 g/m<sup>2</sup> (~10 to 24 µm) can be obtained.
- No sticking to the chill roll – matt and glossy chill rolls can be used
- High scratch resistance because of 48 % higher shore D hardness than LDPE
- Good cutting performance on regular cutting devices
- Good adhesion to paper - depending on card board or paper grade, maximum melt temperature and coating technology
- Good thermo-stability up to 260 °C (500 °F) after drying to <250 ppm residual moisture content
- Appropriate viscosity for extrusion coating: MVR (190 °C (374 °F), 2.16 kg): 18 to 24 ml/10 min.

## Cup Making

ecovio® PS1606 has a good processing performance on cup making machines for LDPE coated board if high air temperatures of 500 °C (932 °F) can be reached. The full speed of 330 cups/minute could be achieved on a Hörauf BMP 400 using 20-25 g/m<sup>2</sup> of ecovio® PS1606.

LDPE cup making speeds can also be achieved on slow running lines with e.g. 50-70 cups/minute.

## Form supplied and storage

**ecovio® PS1606** is supplied as pearl- or cylinder-shaped pellets in 1t big bags with barrier inliner. Temperatures during transportation and storage may not exceed 60 °C (140 °F) at any time. Storage time in an unopened bag may not surpass 12 months at room temperature (23 °C/73 °F).

## Quality Control

**ecovio® PS1606** is produced as a standard material in a continuous production process according to DIN EN ISO 9001: 2000. The melt volume rate, MVR, at 190 °C (374 °F), 2.16 kg, according to ISO 1133 has been defined as specified parameter for quality control. A certificate of the MVR value can be provided with each lot number upon request. Other data given in our literature are typical values, which are not part of our product specification for ecovio® PS1606.

**Typical basic material properties of  
ecovio® PS1606, 20 gsm**

| Property   | Unit   | Test Method    | ecovio® PS1606 | LDPE                |
|--|--|----------------|----------------|---------------------|
| Mass density   | g/cm <sup>3</sup>                            | ISO 1183       | 1.24 – 1.26    | 0.92                |
| Shore D hardness                                     | -  | ISO 868        | 71             | 48                  |
| Melt volume rate MVR<br>190°C, 2.16 kg               | ml/10 min.                                   | ISO 1133       | 18 – 24        | MFR 8 - 25<br>g/10' |
| Vicat VST A/50                                       | °C   | ISO 306        | 61             | 96                  |
| Water Vapor<br>Transmission Rate<br>(23°C, 85% r.H.) | g/(m <sup>2</sup> ·d)                        | ASTM F 1249    | 220            | 13                  |
| Oxygen<br>Transmission Rate<br>(23°C, 0% r.H.)       | cm <sup>3</sup> /<br>(m <sup>2</sup> ·d·bar) | ASTM D<br>3985 | 1400           | 11000               |

**Note**

The information submitted in this document is based on our current knowledge and experience. In view of the many factors that may affect processing and application, these data do not relieve processors of the responsibility of carrying out their own tests and experiments; neither do they imply any legally binding assurance for a special purpose. It is the responsibility of those to whom we supply our products to ensure that any proprietary rights and existing laws and legislation are observed.