



Bayblend[®] FR3006

- (PC+ABS) blend
- Flame retardant grade
- Injection molding
- Global material for TV housing applications

Short description

Bayblend[®] FR3006

Injection molding grade; high heat resistance; Vicat/B 120 = 110 °C; easy flow; UL recognition 94 V-1 at 1.5 mm and V-0 at 2.0 mm.

Characterization

Bayblend[®] FR3006 is a non-reinforced, flame-retardant, amorphous thermoplastic polymer blend based on polycarbonate (PC) and acrylonitrile-butadiene-styrene copolymer (ABS). Its flame retardant properties are achieved through the very latest phosphate/PTFE technology, and Bayblend[®] FR3006 is free from antimony, chlorine and bromine.

Delivery form

Bayblend[®] FR3006 is available worldwide and supplied in the form of oval or cylindrical granules in 25-kg polyethylene sacks, large cartons with a PE liner, in big bags or in bulk. The product is available in its natural color or in a wide range of opaque shades.

The production plants for Bayblend[®] have been certificated to DIN ISO by the appropriate quality organizations.

The certificates can be found in the INTERNET at <http://www.bayermaterialscience.com> (Customer Services/Certificates/Quality).

Applications

Bayblend[®] FR3006 is used primarily in the IT/C (Information Technology & Communication) sector. Typical applications include housings for LCD-TV's, desktop computers and monitors.

Properties (see also table)

Bayblend[®] FR3006 is noted for its high heat resistance combined with excellent flowability. Its properties also include:

- high stiffness and mechanical strength
- good toughness
- chemical compatibility
- good thermal endurance
- very good dimensional stability
- excellent light stability
- outstanding processability
- good flame retardance
- compliance with the relevant requirements of the EU directives (RoHS, WEEE) and EU environmental labels (eco-label scheme).

Mechanical properties

Bayblend[®] FR3006 has a high impact and notched impact strength over a wide range of temperatures. This ensures that housing components in this material can also withstand high external mechanical loading without sustaining any damage. The relatively high stiffness for an unreinforced product (the modulus of elasticity in tension is around 2700 MPa) allows thin-walled parts to be produced with the necessary stiffness too.

Thermal properties

Bayblend[®] FR3006 has a Vicat softening temperature (VST/B 120) of around 110 °C.

This means it considerably exceeds the heat resistance of at least 75 °C in the ball pressure test (IEC 60335-1). FR3006 thus constitutes an ideal housing material for providing protection against contact with live parts.



When components are subjected to a low level of mechanical stressing, no major dimensional changes are to be expected on short-term exposure to temperatures of up to a maximum of 100 °C. The maximum permanent service temperature will depend on the molded part geometry, the type of stressing and the requirements profile.

The melting range starts as of approximately 200 °C, while thermal decomposition commences at about 300 °C.

The coefficient of linear thermal expansion (ISO 11359-1,-2, 23 °C – 55 °C) displays only a low anisotropy and is in the range of $0.68 \times 10^{-4}/K$.

Burning behaviour

Bayblend® FR3006 attains a UL 94 V-0 recognition in a wall thickness of 2.0 mm (all colors) and a V-1 recognition in a wall thickness of 1.5 mm (all colors).

With a wall thickness of 2.0 mm, a glow wire temperature of 960 °C to IEC 60695-2-12 (GWFI) is achieved.

The flame retardancy requirements for television sets specified in the new EN 60065 standard, which will come into force in July 2010, are met at a wall thickness of 1.5 mm and above.

Rheological properties

The key advantage of Bayblend® FR3006 is its combination of good flowability and a high heat resistance. Its excellent flow behavior makes FR3006 particularly suitable for the cost-efficient production of large-area moldings, such as the rear panels of television sets.

The shear viscosity curves can be found in the Appendix.

Chemical resistance

At room temperature, molded parts in Bayblend® are resistant to mineral acids, a large number of organic acids and also aqueous saline solutions. Bayblend® parts are not resistant to bases, aromatics, ketones, esters, chlorinated hydrocarbons and a number of greases and oils. The resistance to chemicals is con-

ditioned inter alia by the temperature, loading duration and the internal and external stress status of the molded part.

Weatherability

As with most thermoplastics, exposure to light/weathering leads to color changes and to a reduction in mechanical properties. This reduction in properties, however, is not so pronounced, and the requirements of the data processing industry for housing materials, for example, can still be met.

The majority of colors reliably fulfil the light aging standard for indoor applications to ASTM D 4459 (the so-called IBM test), which is recognized worldwide in accordance with OEM requirements, with a permitted range of $\Delta E = 1.5$ max.

Processing

Processing is generally performed by injection molding. All modern injection molding machines may be used.

The special product design of FR3006 means that it can be used to reliably produce parts not only by conventional methods but also using the latest processing technologies, such as with a cyclical change in the mold temperature for a demanding surface finish (high gloss), offering a broad processing latitude.

Drying

It is essential for Bayblend® FR3006 to be dried prior to processing. For injection molding, there must be less than 0.02 % residual moisture in the granules. Moisture in the plastic melt can lead to surface defects in the form of streaks and also to hydrolytic degradation (a reduction in the mechanical properties). Drying is best conducted in dry-air dryers.

Drying cycle

2 - 4 h at 95 - 100 °C (dry-air dryer).

Melt temperature¹⁾: 240 to 280 °C

The optimum processing temperature must be established as a function of the molded part. It is advisable to check the actual melt temperature on the ejected press cake using a thermometer. Overheating, and also excessively long residence times for the melt in the barrel must be avoided, since this can lead to material damage, i.e. to a reduction in toughness,



or to surface defects in the form of streaks on the injection-molded part. Thermal decomposition of the material commences at around 300 °C.

1) see also disclaimer at the end of this Technical Information

Mold temperature: 70 to 90 °C

With a uniform mold temperature, this is the optimum temperature range for the production of low-stress parts. While lower temperatures permit shorter cycle times, they lead to poorer molded part qualities.

Mold temperatures in excess of 100 °C are generally recommended for production with a cyclical change in the mold temperature.

Screw speed

The screw speed should be controlled in such a way that the circumferential velocity of the screw is between 0.1 and 0.3 m/s.

Shrinkage

Molding shrinkage is in the range from 0.5 to 0.7 % for Bayblend® FR3006. In addition to the geometry of the part, shrinkage is primarily dependent on the level and duration of holding pressure, as well as on the temperature of the melt and the mold and on the cooling conditions that prevail in the mold.

Further literature

Information on processing can also be found in the following technical publications:

"Processing Data for the Injection Molder",
"The Injection Molding of High-Quality Molded Parts".

Finishing

- Forming: hot-forming processes, such as thermoforming, bending, stamping.
- Machining: sawing, drilling, milling, filing, punching. The use of carbide-tipped tools is recommended.
- Joining: screw connections, gluing, welding.
- Post-treatment: painting, printing, metallizing, foam-coating.

Recycling

After use, single-sort molded parts in Bayblend® FR3006 which do not contain any pollutants can

be mechanically recycled. Molded parts which are not pollutant-free can be chemically recycled or incinerated with energy recovery.

Products should be labeled in accordance with DIN EN ISO 11469. For parts in Bayblend® FR3006 the labeling is:



>PC+ABS FR (40)<

Further details on this can be found in our Technical Information PCS-1164.

Further literature

Brochure: "Bayblend® - the Polycarbonate Blend" containing details of the range of grades – reference data – properties – processing.

Special notes

The information given in Safety Data Sheet No. 112000020442 must be observed.

The safety data sheet is available to registered customers on the Internet at <http://www.bayerone.bayer.com> or can be sent out by request.

It contains details of labeling, handling and storage, as well as information on composition, product safety and toxicological/ecological profiles.

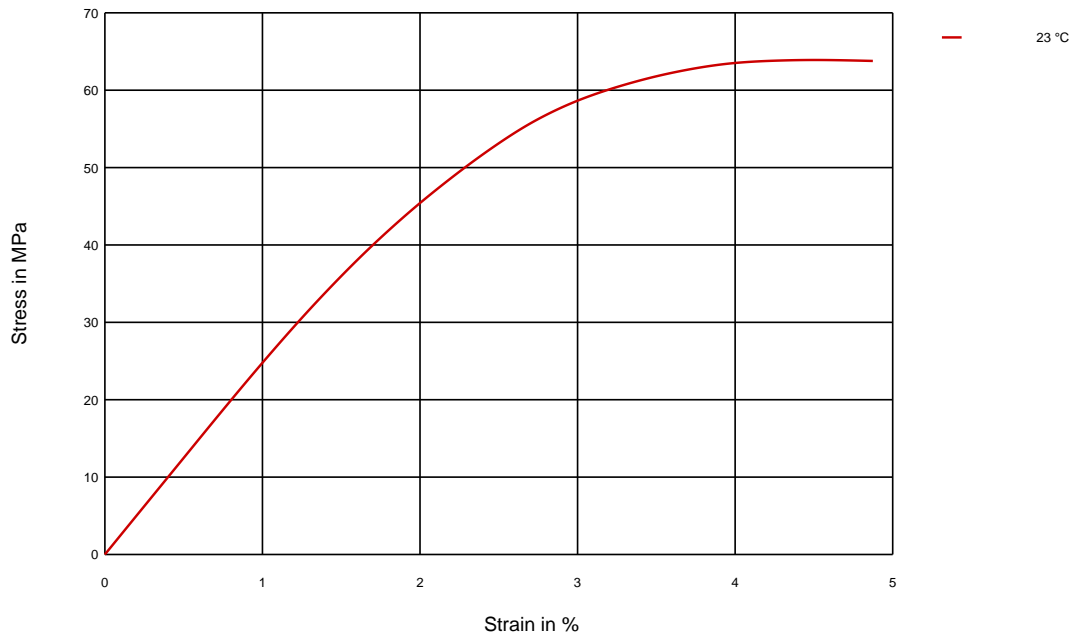


Fig. 1: Isothermal stress-strain curve from the short-time tensile test to ISO 527-1,-2 of Bayblend® FR3006.

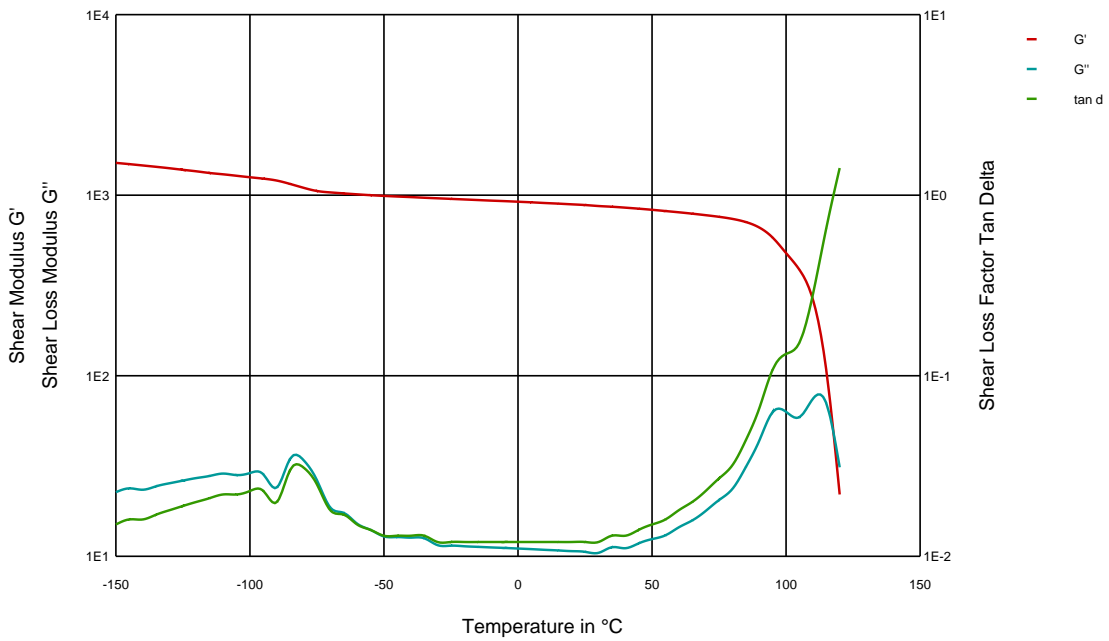


Fig. 2: Shear modulus as a function of temperature to ISO 6721-7 of Bayblend® FR3006.

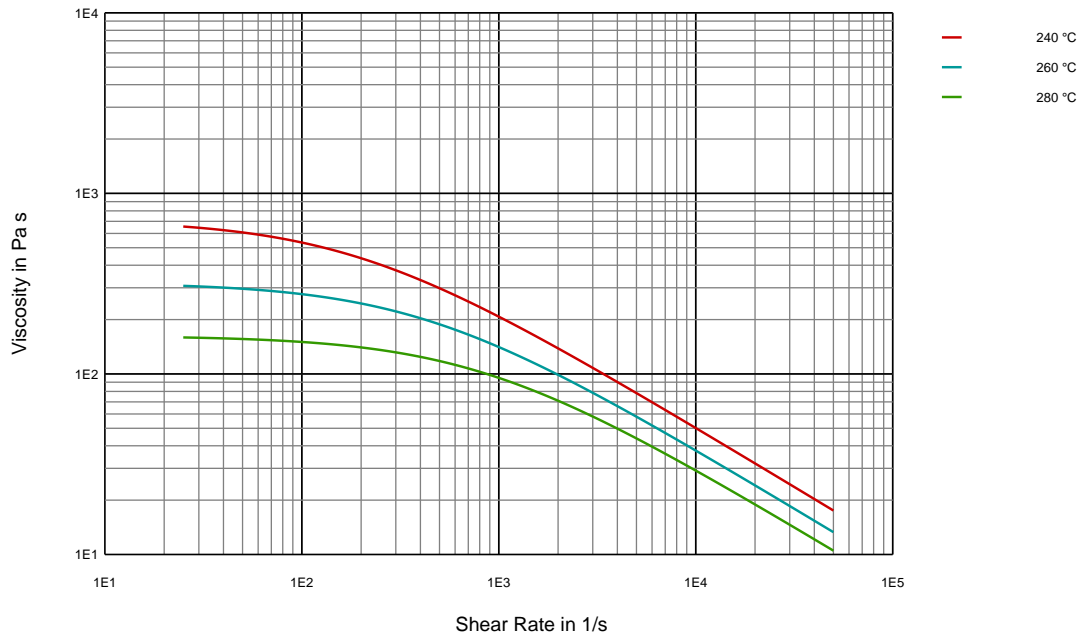


Fig. 3: Melt viscosity as a function of shear rate b. o. ISO 11443-A of Bayblend® FR3006.

Typical Values

| Property | Test Condition | Unit | Standard | Bayblend® FR3006 |
|---|-------------------------------|-------------------------|-------------------|---------------------|
| Rheological properties | | | | |
| C Melt volume-flow rate | 240 °C; 5 kg | cm ³ /10 min | ISO 1133 | 32 |
| Molding shrinkage, parallel | 150x105x3; 240 °C / MT 80 °C | % | b.o. ISO 2577 | 0.5 - 0.7 |
| Molding shrinkage, normal | 150x105x3; 240 °C / MT 80 °C | % | b.o. ISO 2577 | 0.5 - 0.7 |
| Melt viscosity | 1000 s ⁻¹ ; 260 °C | Pa·s | b.o. ISO 11443-A | 140 |
| Mechanical properties (23 °C/50 % r. h.) | | | | |
| C Tensile modulus | 1 mm/min | MPa | ISO 527-1,-2 | 2700 |
| C Yield stress | 50 mm/min | MPa | ISO 527-1,-2 | 60 |
| C Yield strain | 50 mm/min | % | ISO 527-1,-2 | 4.0 |
| Stress at break | 50 mm/min | MPa | ISO 527-1,-2 | 50 |
| Strain at break | 50 mm/min | % | b.o. ISO 527-1,-2 | > 50 |
| Izod impact strength | 23 °C | kJ/m ² | ISO 180-U | N |
| Izod notched impact strength | 23 °C | kJ/m ² | ISO 180-A | 12 |
| Thermal properties | | | | |
| C Temperature of deflection under load | 1.80 MPa | °C | ISO 75-1,-2 | 91 |
| C Temperature of deflection under load | 0.45 MPa | °C | ISO 75-1,-2 | 101 |
| C Vicat softening temperature | 50 N; 50 °C/h | °C | ISO 306 | 108 |
| Vicat softening temperature | 50 N; 120 °C/h | °C | ISO 306 | 110 |
| C Coefficient of linear thermal expansion, parallel | 23 to 55 °C | 10 ⁻⁴ /K | ISO 11359-1,-2 | 0.68 |
| C Coefficient of linear thermal expansion, transverse | 23 to 55 °C | 10 ⁻⁴ /K | ISO 11359-1,-2 | 0.68 |
| C Burning behavior UL 94 (1.5 mm) | 1.5 mm | Class | UL 94 | V-1 |
| C Burning behavior UL 94 | 2.0 mm | Class | UL 94 | V-0 |
| Electrical properties (23 °C/50 % r. h.) | | | | |
| C Relative permittivity | 100 Hz | - | IEC 60250 | 3.2 |
| C Relative permittivity | 1 MHz | - | IEC 60250 | 3.1 |
| C Dissipation factor | 100 Hz | 10 ⁻⁴ | IEC 60250 | 50 |
| C Dissipation factor | 1 MHz | 10 ⁻⁴ | IEC 60250 | 70 |
| C Volume resistivity | | Ohm·m | IEC 60093 | 1E14 |
| C Surface resistivity | | Ohm | IEC 60093 | 1E16 |
| C Electrical strength | 1 mm | kV/mm | IEC 60243-1 | 30 |
| C Comparative tracking index CTI | Solution A | Rating | IEC 60112 | 350 |
| Other properties (23 °C) | | | | |
| C Water absorption (saturation value) | Water at 23 °C | % | ISO 62 | 0.5 |
| C Water absorption (equilibrium value) | 23 °C; 50 % r. h. | % | ISO 62 | 0.2 |
| C Density | | kg/m ³ | ISO 1183-1 | 1180 |
| Processing conditions for test specimens | | | | |
| C Injection molding-Melt temperature | | °C | ISO 294 | 240 |
| C Injection molding-Mold temperature | | °C | ISO 294 | 80 |
| C Injection molding-Injection velocity | | mm/s | ISO 294 | 240 |

C These property characteristics are taken from the CAMPUS plastics data bank and are based on the international catalogue of basic data for plastics according to ISO 10350.

Impact properties: N = non-break, P = partial break, C = complete break

colored fields = UL recognition

Remark melt viscosity: true viscosity determined using the method of representative viscosity.



This information and our technical advice - whether verbal, in writing or by way of trials - are given in good faith but without warranty, and this also applies where proprietary rights of third parties are involved. Our advice does not release you from the obligation to check its validity and to test our products as to their suitability for the intended processes and uses. The application, use and processing of our products and the products manufactured by you on the basis of our technical advice are beyond our control and, therefore, entirely your own responsibility. Our products are sold in accordance with the current version of our General Conditions of Sale and Delivery.

Unless specified to the contrary, the values given have been established on standardized test specimens at room temperature. The figures should be regarded as guide values only and not as binding minimum values. Please note that, under certain conditions, the properties can be affected to a considerable extent by the design of the mold/die, the processing conditions and coloring.

Under the recommended processing conditions small quantities of decomposition product may be given off during processing. To preclude any risk to the health and well-being of the machine operatives, tolerance limits for the work environment must be ensured by the provision of efficient exhaust ventilation and fresh air at the workplace in accordance with the Safety Data Sheet. In order to prevent the partial decomposition of the polymer and the generation of volatile decomposition products, the prescribed processing temperatures should not be substantially exceeded.

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