Glossy Components without Painting

Aliphatic High-Performance Polyamide for Plastic Surfaces

Optics play an increasingly important role in plastic components. Glossy and even surfaces are decisive for an attractive appearance. With glass fiber-reinforced polyamides (PA), these requirements can usually only be achieved with an additional coating. A PA specially developed for surface design offers an alternative approach.

A high-quality surface finish is more important than ever for polymer applications, because product design plays an increasingly important role as sales argument for the end product. A decorative, aesthetically pleasing surface is required above all, for visible components which, additionally need to be resistant to scratching and the effects of chemicals. The surface gloss of glass fiber-reinforced polyamides is often insufficient for visible parts because the surface is too rough or uneven. Partially-crystalline polyamides shrink during cooling, leaving sink marks or rough areas on the surface due to exposed glass fibers. Injection-molding parts with a complex design, therefore, often need to be painted in an elaborate post-treatment process to cover critical areas.

For visible components, an even, glossy surface is often desired, which is often difficult to achieve with glass fiber-reinforced PA. PA Grivory G7V from EMS now solves this problem © EMS-Chemie

Grivory G7V, available from EMS-Grivory, Domat/Ems, Switzerland, since 2020, combines properties such as high stiffness and strength even after moisture uptake, as well as the chemical resistance of a Grivory GV, with the high surface quality of a polyamide with no or only low levels of reinforcement.

Grivory G7V was developed for metal-replacement applications requiring outstanding surface quality. The material is made up of a new aliphatic high-performance polyamide. With its well-balanced property profile, this makes cost-efficient manufacturing of light-weight components possible without any additional painting processes being necessary.

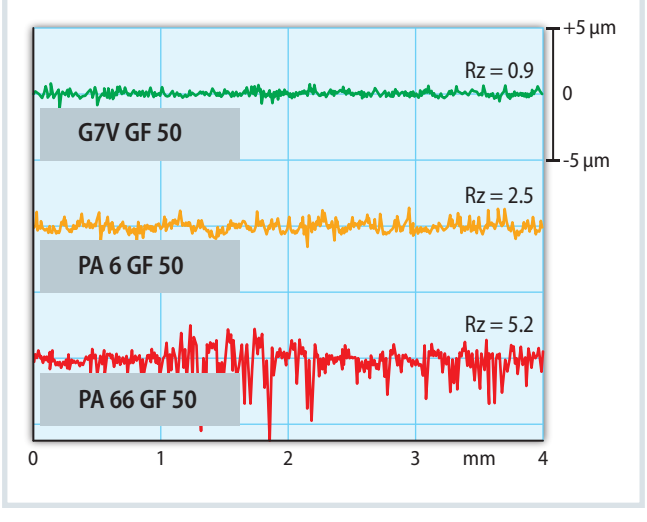

Fig. 1. Grivory G7V achieves significantly smoother surfaces at the same mold temperature than PA6 and PA66 with the same glass fiber content. This minimizes wear and tear and ensures reduced noise development
Source: EMS-Chemie, graphic: © Hanser

Improved Surface Quality and High Stiffness

The material has a melting point of 215 °C and provides all advantages of a partially aliphatic polyamide such as PA6 or PA66: simple processing, high stiffness and strength as well as resistance to chemicals. Thanks to low shrinkage and, in comparison to PA66, reduced crystallization speed, more glossy, smoother, even and more easily cleaned surfaces are created. Apart from the surface gloss or the first-class surface optic, the latter point is significant with regard to disinfection with alcoholic solutions. In addition, a smooth surface minimizes friction noise and wear.

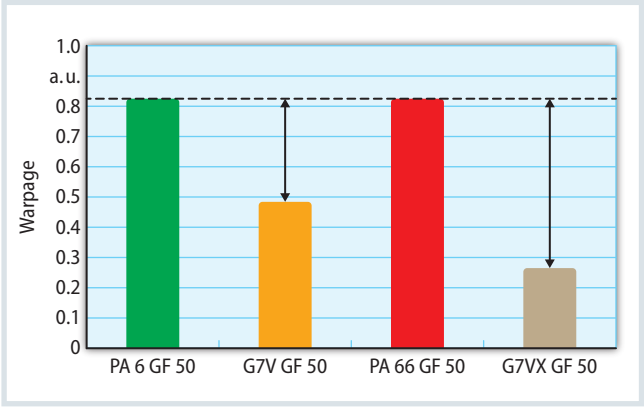

Fig. 2. Even as a basic variant with a glass fiber content of 40 %, Grivory G7V has less warpage than PA6 and PA66 with the same glass fiber content. With specially treated X grades, warpage can be halved again

Source: EMS-Chemie, graphic: © Hanser

At the same time, the PA has reduced water uptake as well as comparable stiffness and strength in a dry and equilibrated state.

First Class Uniformity despite a Higher Glass Fiber Content

The polymer-glass-fiber system Grivory G7V improves the surface quality significantly even at sustained high levels of glass-fiber reinforcement. Through time-delayed solidification behavior, the structure of the mold surface is ideally reproduced without any lengthening of the cycle time. A further advantage of this aliphatic polyamide is its very low shrinkage. This allows very precise components to be manufactured and the risk of an undulating surface due to sinking of the polymer in between the glass fibers, (so-called "orange skin"), is significantly reduced. Already with the basis grade Grivory G7V-5H (GF 50), it is possible to manufacture parts with low warpage, high-quality surface properties and medium roughness (Rz) of lower than 1 µm (**Fig. 1**). Special X-grades reduce warpage even further (**Fig. 2**).

Gloss and Hardness Combined

A higher and uniform surface gloss defines the quality and brilliance of a surface. As an additional property, high surface hardness is required because the surface must be resistant to scratching. Grivory G7V combines these properties in one product.

If a surface achieves a gloss value of >70 with an incidence angle of 60°, it is considered to be a high-gloss finish. All new Grivory G7V grades with 50 % glass fiber-reinforcement satisfy these requirements without difficulty (**Fig. 3**).

In addition, the surface of the new Grivory G7V is up to 75 % harder and therefore, more resistant to scratching than the surface of conventional reinforced polyamides (**Fig. 4**). This is achieved above all, through the properties of the new high-performance polyamide.

The new Grivory G7V has been developed to satisfy design requirements of end-customers and to allow simple processing using injection-molding processes. With its good flowability and wide processing window, the material can be processed without problems. Excellent surface quality is already achieved at melt temperatures from 270 °C and conventional mold temperatures between 100 °C and 120 °C. With melt and mold temperatures as low as this, injection-molders can save both energy and costs.

Varied Range of Use

Thanks to the property profile of Grivory G7V, target applications are many and varied. The material is especially suitable for the manufacture of structural components in automotive interiors such as air-vent lamellas, instrument panel supports or seat shells and handles. Grivory G7V is also suitable for use in functional components in mechanical engineering as well as for fixing elements and brackets in the sport and industrial sectors or for furniture fittings. Potential end products can, however, also be found in the food and medical trades where surfaces with no cracks or pores are especially important to minimize the risk of pollution or, in the worst case, cross-contamination.

Grivory G7V sets new standards with regard to surface quality and simple processing. Due to its uniform high quality, components in nearly any color can be manufactured economically and without any additional coating processes. At the same time, Grivory G7V improves the eco-balance of finished components because additional painting processes are no longer necessary. ■

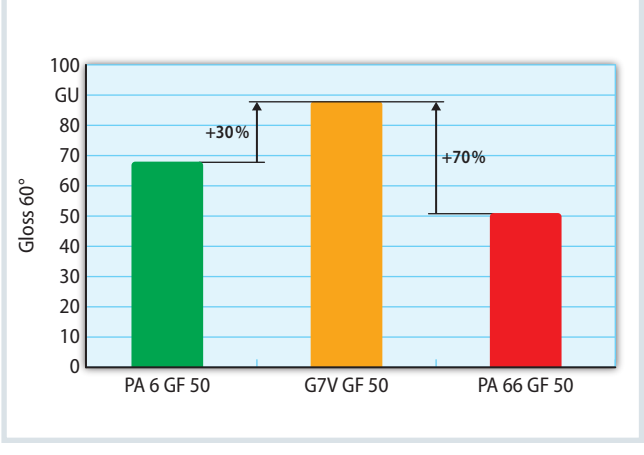

Fig. 3. Due to its significantly harder surface, Grivory G7V is less sensitive to scratches than conventional PA types Source: EMS-Chemie, graphic: © Hanser

The Authors

Ronny Ebling is Product Manager Grivory GV & Grilamid TR at EMS-Grivory, Domat/Ems, Switzerland.

Dr. Philipp Harder is Project Leader R&D at EMS-Grivory, Domat/Ems, Switzerland.

Service

Digital Version

↘ A PDF file of the article can be found at ***www.kunststoffe-international.com/2020-6***

German Version

↘ Read the German version of the article in our magazine ***Kunststoffe*** or at ***www.kunststoffe.de***